



FRIDAY, JULY 18.

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Contributions.

Top Motion of Deep Foundation.

Dwight, Ill., July 10, 1890.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Your notes of June 20, touching the motion of the piers of Hawksbury Bridge, Australia, lead us to mention an early experience in driving piles and their motion after being driven.

Back of Cruger's Island, the original construction of the Hudson River Railroad was a pile bridge. The morass which occasioned it was deep and similar in character to the material through which the piers of the Hawksbury Bridge were constructed. Indeed, for many feet below the surface the mud was almost liquid.

The piles were driven to a depth of 125 ft. The point piles, 30 ft. in length, when put in position, settled by their own weight nearly their entire length. When the last section was put on and the depth spoken of reached, the final blow of a 3,000 lb. hammer drove the piles about six feet, but tests made 12 hours after they were driven demonstrated their resistance to be greater than that of piles driven to ordinary depths in harder material.

Laterally, the piles were almost swayed by the wind, and a man could easily swing the tops around as far as he could reach, although they projected no more than 12 ft. above the surface of the marsh.

The direct support being made thoroughly competent by *adhesion*, a suitable connection of the tops of the piles completed a satisfactory bridge. It was as firm longitudinally as need be, but, as stated, in respect to the motion of the piers of the Hawksbury Bridge, "irregular and frequent, slight lateral motion" occurred.

If what has been related is not suggestive in respect to the "novel question" raised, you may regard it independently of sufficient interest to young engineers to justify presenting it to them.

RICHARD P. MORGAN & Co.

Value of Premiums for Trainmen.

Seattle, Lake Shore & Eastern Railway Co.,
Superintendent's Office,
SEATTLE, Wash., July 7, 1890.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Agreeably to your request, made some time ago, I give you the results of our premium system for trainmen, as shown by two months' trial.

You will bear in mind that we have an unusually hilly and crooked road. The maximum grades are 2 per cent. and the maximum curves 12 deg. One-fourth of our traffic is logs and piles, ranging from 20 to 125 ft. in length, hauled on trucks placed under each end of the timber, without couplings other than the logs, chained to the trucks. Men familiar with lumber countries know that this is the most hazardous traffic known to railroads, especially on hills and curves.

The number of trains of all kinds run in two months was 1,750, or an average of 28½ trains per day. Our freight train averages show an increase of 9½ cars per train. There was not a wheel off the track, and the accident reports for the two months are easily summed up. One Miller drawbar was shoved in; total damage by accidents of all kinds, \$2.50; decrease of pay roll for the two months, \$172.50. Increase of traffic, 6,504 passengers and 1,500 freight cars over the previous two months.

The improvement in the service cannot be estimated, and can only be appreciated by being seen. We would not take \$2,000 a month and discontinue the use of the premium system. Our men are now the best I have seen; in fact their work is as near perfect as it is possible to get, and all of them are friends of the premium system. I have not heard of a single complaint of any

kind from any of them and they are all fighting for the road. Money paid for overtime in two months was \$15.50.

F. W. DUNN.

[Mr. Dunn's premium system and his methods of keeping the record of the men's performances were the subject of articles in the *Railroad Gazette* of April 25, May 23 and June 20 last.]

Lighting at Wrecks.

CEDAR RAPIDS, Iowa, July 12, 1890.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In your issue of the 4th inst., under the head of "Lighting at Wrecks," reference is made to the Pennsylvania Railroad electric light car, citing instances of rapid work setting up the light at wrecks, but several important points are omitted. It is not stated whether the electric light car came out with the wrecking outfit, or by special engine, or whether the outfit had to wait until the lights were put up; whether the above car is placed a few hundred yards back on the main line; whether a spur track is built for it, or whether it is waltzed up and down with the outfit while clearing track. When it is necessary to run to a side track with cars that have been replaced on the rails, what becomes of the light when the dynamo car has to go in also?

Every man who is competent to handle a wreck knows that a wrecking outfit requires the free use of the track between the nearest side track and the wreck, and would be likely to need the same on the other side as soon as an engine could be got to work there. He also knows that the light would be wanted when the engine was pulling cars to the side track, because at that time every man on the ground could be employed on the track, or about the wreck, so as to facilitate operations. The electric light at wrecks would be a great boon, providing the car could be placed out of the way. Practically, I know nothing of the Lucigen or Wells light, but I have been familiar with the electric light for many years.

The common plan of lighting fires near the track with pieces of broken cars is objectionable, and the light shown by the ordinary hand signal lamp is scarcely sufficient, on a dark, rainy or snowy night, to make the darkness visible. There is no doubt but that some handy, portable apparatus, which will give a powerful light, with very little attendance, would be a valuable addition to every wrecking outfit. In clearing a track, the main point is time, so as to get trains passing as soon as possible, and anything, which in any way interferes with the opening up of the track, is objectionable.

P. W. HYNES.

Concerning Pony Trucks and Indicating.

TO THE EDITOR OF THE RAILROAD GAZETTE:

It seems to me that in the discussion on this subject, reported in the *Railroad Gazette* of June 20, it was overlooked that an objection to pony trucks comes in, not merely in the liability to let down the engine badly if one wheel fails or the pony axle breaks, but in regard to the heating of the bearings. In some colonial experience of a class of engine with leading trucks, there was no fault to be found with the pony trucks, further than that their bearings heated and it was found desirable in future engines to use four-wheeled trucks to reduce the weight per axle. The small wheels of trucks revolve at a high speed, and give probably a higher rubbing velocity on the bearings than is found on the main bearings, and so a less pressure is allowable; and though I cannot now give figures, I know it was excessive on the pony trucks for a dusty roadbed in a hot country. I may add that curves of 523 ft. radius were common, and it was customary to oil with castor oil, which was quite fluid enough in the hot weather to flow freely.

Mr. Dean writes upon the sticking of indicator pistons. As a rule treatises on the indicator advise the use of a fine thin oil for lubricating the pistons of indicators. A long and varied experience in indicating all manner of engines up to the highly explosive gas engine has convinced me that such advice is quite wrong, and I have now for a long time always used some thick cylinder oil, astraline or castor oil for indicating purposes, very freely applied; and though it may slightly impede the motion of the indicator piston, my experience decidedly points to its power of securing freedom of motion from jerkiness. An oil with body in it better prevents the piston "cornering" in the cylinder, which is the chief cause of sticking; though I have found very curious results follow upon a very fine bit of grit on the rod. Thin oil cannot stand the side pressure which takes place in every indicator piston.

As a rule, too, indicator pistons are made too short for proper working. They would be better if longer and less liable to corner, though, of course, any extra weight is an objection and to be avoided, if possible.

Generally there is far too little outlet for steam which passes a leaky indicator piston. I have seen and taken diagrams with a leaking piston which were most misleading. The piston may with no bad effect be allowed to leak quite freely, if only a good escape is left for the steam above it. It is best to drill a pair of holes in the cover, and fit two ½-in. angle bends of small brass pipe so turned as to blow the steam away from the hands of the operator and from the cards. A piston may leak very freely and give truthful diagrams, and is specially

suitable to be oiled with a thick oil, which stops the leaking of steam, too, for some time.

As a rule operators try to secure diagrams both too high and too long. The annexed figure is big enough



when taken carefully with a fine gun-metal point to measure from, and springs are made quite accurate for such figures. The diagram annexed gave results almost identical with those given by a diagram of double size taken at the same speed—about 80 revolutions. Had the speed been high—300 to 400—the small diagram would have shown quite a difference, being more accurate than a larger one.

W. H. BOOTH.

Efficiency of the Locomotive and Electric Motor.

71 BROADWAY, NEW YORK, July 15, 1890.

TO THE EDITOR OF THE RAILROAD GAZETTE:

It is important at this time that the truth concerning the merits of electric locomotives should be known and errors corrected. Permit me to call attention to one error in the very able and courteous criticism of my paper, which appeared in last week's *Railroad Gazette*. The writer considers the sharp rise of the power diagram curve to be due to overloading of the plant, and says: "At 12 miles per hour, the indicated horse power per ton of train load is given as 4.68. At that time the train load was about 55 tons. The total indicated horse power was about 260." Unfortunately, he failed to see a paragraph in the *Cresson* paper, page 11, which says "the extreme right hand ordinate was figured from a test of two cars weighing 50,000 lbs. together." Surely, with these facts in view, so careful a paper as the *Railroad Gazette* would not say that the curve of increase was abnormal because of overloading. If there was any overloading, it occurred in the lower portions of the curve at slow speeds, when the trains weighed 118,000 lbs. In no case did the average I. H. P. exceed or even come up to the power for which the dynamos were built. There can be no doubt that a more expensive plant would have given better economy, but incompetent and inadequate as it was throughout, the 300-horse boilers, 300-horse engine, 150,000-watts dynamos and the 120-horse motor represented nearly \$30,000 to produce the commercial result of propelling two empty cars at 12 miles per hour net. In order to give such economy as you think possible, enormous sums of money would have to be spent for motive power, while on the other hand a little \$4,000 locomotive will handle a 60-ton train with perfect independence and with economy.

I looked in vain for a reference to the weak point in operation, viz.: the dependence upon the one line and current; we found that a short circuit would stop all traffic on the section, and by causing the dynamos to lose their resistance the machinery would run away and throw off the belts. Such a defect is vital and as objectionable as a cable road depending on but one rope.

The "4,500 lbs. pull for an instant," which is alluded to as uncertain, partook more of the nature of a jerk than a pull; we did not find a "steady pull of 7,200 lbs.," much less "9,000 or 15,000 for an instant with the locomotive." The first initial surges would not exceed 8,000 lbs. My knowledge of the exact power of the electric motor is limited to the statement of the builder who said that it showed 120 H. P. by brake test at the armature, which is about the same as the maximum power of the locomotive used in these tests.

My figure for water per horse-power-hour by compound condensing engines was 20 lbs., and agrees with an estimate obtained to-day from one of the finest Corliss engine works in this country, and is what may be expected for such unsteady service as electric railroads, electric lighting and cable railroads. The same maker will guarantee one horse power hour with 16 lbs. of water on steady work. If you assume to burn coal costing only \$2.50 per ton in the furnaces, the assumed evaporative duty should not be over 6 or 7 lbs. of dry steam per pound of refuse coal. You also state that the evaporative figure for locomotives is "too high for working conditions." My paper stated that this engine coal "generates 7 lbs. of steam per pound of coal;" it does not say *dry* steam. No doubt steam users would prefer to pay for their water on the basis of the percentage converted into dry steam, but as they pay for what goes into the boiler, I stated that figure for which the company must pay.

Your able critic hinted further at several unfavorable conditions, but overlooked several that would reduce the efficiency found. 1. They were not called upon to furnish power for braking nor heat for the cars; the locomotives do both, and show an actual performance of 1 horse power per hour on 5 to 6 lbs. of coal. 2. All the tests were made in dry weather, and all electricians are familiar with the greatly increased losses in wet weather, a most important point in sea coast or lake cities with frequent rains. 3. A reduction of the poten-

tial to a safe limit would very materially have lessened the efficiency, as the reduction in voltage would be made up by an increase in the amperes, and as the current waste varies as the square of the current (C^2R), this question of voltage is a most important one in economy.

With reference to the time and dynamometer observations, it was a simple matter to arrange marks and lanterns. This work was intrusted to five of the most careful men I could find. The average interval between time readings was 18 seconds, surely close enough for all practical purposes.

Would it not be fairer in making comparisons with electricity for projected roads to figure against the highest type of locomotive—the compound? I fail to see the difference between a large horse power and a strong pull, for if the motor possesses one element it will have both.

You speak of the loss in the line as too great. It was insulated with the greatest care. Probably the loss would have been less with a low tension and greater with a higher voltage. It will be found that these locomotives have as much power in proportion to their loads and speeds as ordinary surface road engines, and their comparatively low speed is very favorable to economy. It will also be found that I divided the line resistance among four trains and did not charge it all to one.

Finally, I wish to say that the concluding estimate was intended to apply to the New York roads and others where similar conditions exist; it does not need an engineer to see that the estimate could not apply to a railroad contiguous to a large waterfall or a culm bank, nor would it apply to a high tension system, nor to one where the investors were willing to spend more than \$1,500 per car for motive power, as was done in this experiment.

LINCOLN MOSS.

Some Tests of the "Frost Carbureter."

Early in June some tests of the Frost "dry carbureter," as used in the Frost system of lighting railroad cars by gasoline, were made at Altoona. These tests were made at the request of the editor of the *Railroad Gazette* and were witnessed by two members of the staff of this journal. They were designed to ascertain, as nearly as might be done, the behavior of the carbureter in a wreck. It will be remembered that in the "Thaxton's" wreck of July 2, 1889, on the Norfolk & Western, a car fitted with these carbureters was burned. The car was entirely consumed but the carbureters taken from the wreck showed no sign of explosion. They were distorted and the soldered joints opened by the heat, but the lights were put out by the shock of the wreck, the fire did not start for an hour and a half later and there is no evidence that the gasoline had any effect on it in any way.

Nevertheless, it has been suggested that there are two ways in which this system of lighting might cause disaster in case of a wreck. It has been said that a carbureter might be ruptured and a car flooded with the volatile and inflammable gasoline; or that in case of a fire the rapid vaporization of the gasoline in the carbureter would cause an explosion. It was to show the probability of either of these events that the tests were

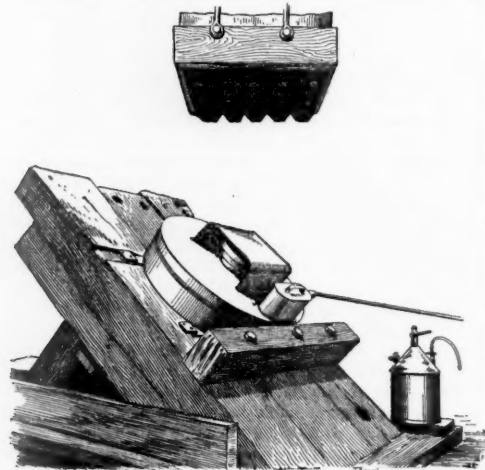


Fig. 1.

made. Before describing them we will briefly explain the system and the arrangement of the carbureters. These were very fully illustrated and described in our issue of June 7, 1889.

Each carbureter consists of a cylindrical case of copper about 4 in. high and 2 ft. diameter. This cylinder is of tough copper, the bottom and sides spun up in one piece and the top soldered on. Within the cylinder is a metal spiral about 40 ft. long holding cotton wicking. The cylinder is completely filled with this wicking. The whole is inclosed in a double, kalamein iron mantle, and this mantle is lined with straw-board as a non-conductor. Between the carbureter and the mantle is an air space. The gasoline is completely absorbed in the wicking; there is no void in the carbureter to accumulate gas, and if all the cocks are opened there is no free gasoline to escape.

The illuminating gas is obtained by passing compressed air from the air-brake service through the carbureter

under a pressure of three pounds per square inch. When the lights are not burning there is no flow of air through the carbureter, and hence no gas is generated. If the pipe between the air reservoir and the carbureter is broken, there is nothing to escape but air. On the other side of the carbureter there is no pipe, except a few inches leading directly to the lamp. Rupture of this pipe simply puts out the light. Outside the car, near the carbureter, is a mercurial safety valve set to blow off at five pounds. This is to relieve the carbureter in case the gasoline is rapidly vaporized as in the case of a wreck fire.

The first of the tests at Altoona was to show what might happen in case the carbureter was subjected to a heavy blow in a wreck. A new carbureter was placed on a solid backing of timbers, as shown in fig. 1. The timber backing was, of course, far more substantial than that which the carbureter would have in its normal position on the top of a car, and the effect of a blow delivered upon it must be correspondingly more severe. Back of the timbers was a gas lamp connected with the carbureter. The carbureter was charged with four gallons of gasoline, and air was forced in by a hand pump to a pressure of three pounds per square inch. A drop, weighing 2,079 lbs., was arranged above the carbureter, and shod with timber, the end of which was serrated to represent somewhat the conditions which might be had in a wreck. The bottom of this drop is seen in fig. 1.

This weight of 2,079 lbs. was dropped from a height of 33 ft. 4 in., striking square on the carbureter and crushing it as shown in fig. 2. The copper was not ruptured, but

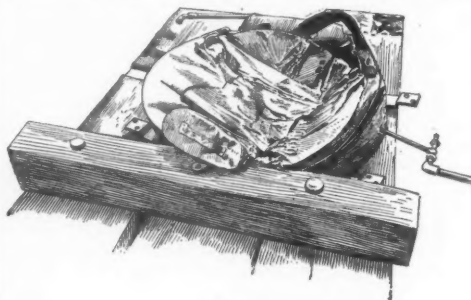


Fig. 2.

a small pipe inside the carbureter which extends into a pocket in the bottom of it, for the purpose of draining off gasoline left in charging, was driven through the metal. The seam where the top plate of the carbureter joins the side was opened for about half an inch in one place. Through these small openings a small amount of gasoline was squeezed out. It was estimated that perhaps half a pint escaped in this way; possibly, it may have been a pint. The iron case was then stripped off the carbureter, it was turned bottom side up, and the weight was again dropped upon it with the same fall, viz. 33 ft. 4 in. In the first blow the wood had been entirely knocked off the bottom of the drop, so that in this case the carbureter was subjected to a blow from the iron ball alone. The result of this blow is shown in fig. 3. The timber backing was entirely demolished. Further openings were made in the soldered seams of the carbureter, but the copper was not ruptured. More gasoline was squeezed out; it was difficult to estimate how much, but it was not considered at all probable that the amount reached a quart after both blows. Of course, the carbureter was smashed flat, so that the volume inside was greatly reduced, and it was physically impossible that there should not have been some escape of gasoline. However, it must be remembered that the carbureter was charged with four gallons immediately before the tests were made; the service charge is two gallons, while the first charging of a new carbureter is but $3\frac{1}{2}$ gallons. The amount of gasoline which escaped in this case was a good deal less than the excess of the charge over the usual first charge of a new carbureter. After seeing this test it is difficult to conceive circumstances under which any gasoline would be forced out of the carbureter from a blow in a wreck. The gas lamp which was burning back of the carbureter was extinguished instantly at the first blow.

The second test was made to determine whether or not there was any danger of exploding a carbureter by the rapid generation of gas when it is subjected to intense heat. A new carbureter was charged with four gallons of gasoline and supported on an iron frame about 4 ft. from the ground. Pine wood and shavings saturated with oil were piled under and around and over this carbureter and set on fire. A very fierce fire resulted, exposing the apparatus to a heat which it could hardly be subjected to in a wreck fire. Before the fire was started the air pressure had been pumped up to 3 lbs. per square inch, as shown by a gauge attached to the carbureter by a long pipe. On the other side of the carbureter was placed one of the mercurial safety valves, occupying essentially the position which it has when in service. Two

minutes after the fire was started the pressure rose to 5 lbs., and immediately began to blow off through the safety valve. The escaping gas ignited there and the mercury was quickly volatilized and there was no further increase of pressure; that is, throughout the rest of the experiment the index wavered up and down from zero to about 2 or $2\frac{1}{2}$ lbs. This pressure was caused solely by the resistance to the flow of the gas in the pipe, the vapor of the gasoline escaping as fast as it could through

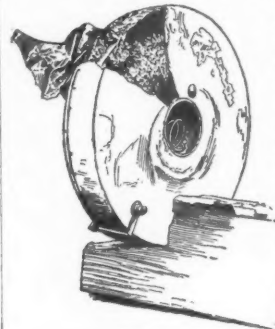


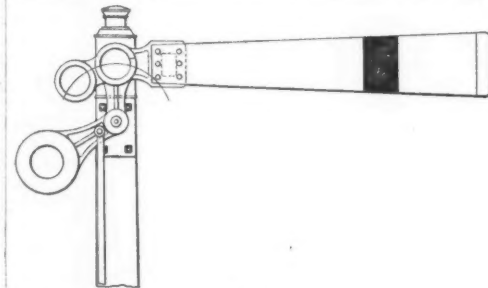
Fig. 4.

the pipe leading to the safety valve. The seams were gradually unsoldered and gasoline vapor escaped at various points as well as at the safety valve pipe. Of course, it ignited and burned fiercely. After the fire had burned about 25 minutes it was extinguished and the carbureter carefully examined. There had been no explosion, or anything approaching one. The soldered seams were opened at various places.

Altogether, any one who witnessed these tests cannot help coming to the conclusion that the two elements of danger which have been suggested above are entirely absent in this system. So far as concerns the traveling public there seems to be nothing left to be desired in the matter of safety.

Grafton's Bell Crank Movement for Semaphore Signals.

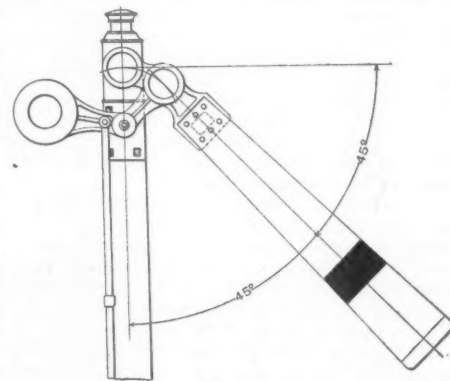
The illustrations show a movement devised and patented by Mr. W. M. Grafton, Signal Engineer of the Pennsylvania Lines West of Pittsburgh. As shown here the movement is applied to a post with the lamp on the top. It is equally applicable to a post with a side lamp, and in fact is in use on such posts. This application we have not shown, for it involves simply changing the positions of the disks showing red and green lights. Mr. Grafton also applies the same movement to a two-



Danger.

position, high switch signal. This latter application involves no change in the details of the movement and therefore is not shown.

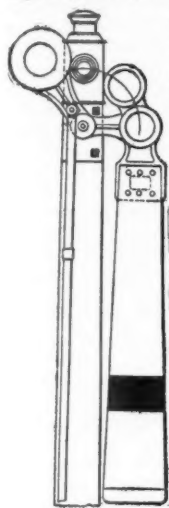
The primary object has been to get a positive and unmistakable position for the clear signal. This is obtained by throwing the blade clear of the post, and, at the same time, placing it in a perpendicular position for clear. The caution position is midway between danger (horizontal) and clear (vertical); that is, the blade is inclined 45 degs. to the horizontal. Where semaphore signals are used to indicate danger, caution and clear,



Caution.

it is essential that the distinction between these positions should be accurately defined, and such that the indications of the signal can be read without mistake. This, of course, is particularly true where position is relied upon entirely for the indications. We have already noted that this is the practice on the lines over which Mr. Grafton has charge as Signal Engineer. All signals are

painted a uniform color, regardless of the indications that they are to give, and red is discarded for semaphore arms. It is intended also to carry this principle into night signals by the use of illuminated blades. With the



Clear.

ordinary semaphore movement the distinction between the caution position at, say, $37\frac{1}{2}$ degs. to the horizontal and the clear position at 75 degs. is a difficult one to maintain precisely, and it is almost impossible for a runner on an engine moving rapidly, and rolling more or less, to distinguish between the two angles, even when the connections are in perfect order and the semaphore hangs exactly as it is intended that it should. With the movement here shown there can be no question as to the reading. In the clear position the blade is not only vertical, but it is distinctly visible, and its indication is unmistakable. Heretofore where the vertical position of the semaphore has been used to show clear it has usually been dropped down behind the post or into a slot cut in the post. This practice is obviously a bad one, for the runner cannot tell whether the semaphore blade dropped off or not, and consequently does not know whether he is actually getting a clear signal.

The caution position may vary considerably from the 45-deg. angle without danger of confusion, as the other positions are clearly defined.

Stamped Steel Axle Boxes.

We reproduce from *Engineering* illustrations showing, and a description of, two steel axle boxes recently brought out. The new application of material will doubtless be suggestive to those who are working for improvement in our own practice in this detail. The method of lubrication with oil, as shown in fig. 1, has long been known to and somewhat considered by American railroad men, but it has not been considered practicable, because of the want of dust tight and oil tight boxes. We will hazard the prediction, however, that some method of lubricating car journals with oil in dust tight and oil tight boxes will eventually be reached and become universal in this country. What follows is from *Engineering*:

Of course, many attempts have been made to supersede the ordinary cast-iron axle box, as the immediate economy is evidently great. The most natural method was to use cast steel, and this has been tried very perseveringly. But the form of an axle box is not one which is suitable for production in cast steel, since it does not lend itself to even cooling. The result is that honeycombs and bad and unreliable castings are frequent, and cast steel has been found in many cases less reliable than iron. Another method is to form the boxes of mild steel plate, pressed to the requisite form. After long experiment this method has been worked out to a very successful conclusion by the Patent Stamped Steel Railway Axle Box Co., Limited.

Figs. 1 to 4 represent a stamped steel axle box of the pattern chiefly in use on all bogie wagon stock, while figs. 5 to 7 show a box of the grease-box type in use on English wagons. For the manufacture of these stamped boxes works have been erected at Orchard place, Blackwall, London, designed for a large output. They are fitted with the most modern arrangements of furnaces and gas welding plant, and with a large number of exceedingly well-designed and powerful presses, so disposed that a plate may be bent into its final form at one heat, even if three or four consecutive sets of dies are required to accomplish the end. Less than a minute suffices to draw a plate from the furnace and stamp it to the final form ready for welding.

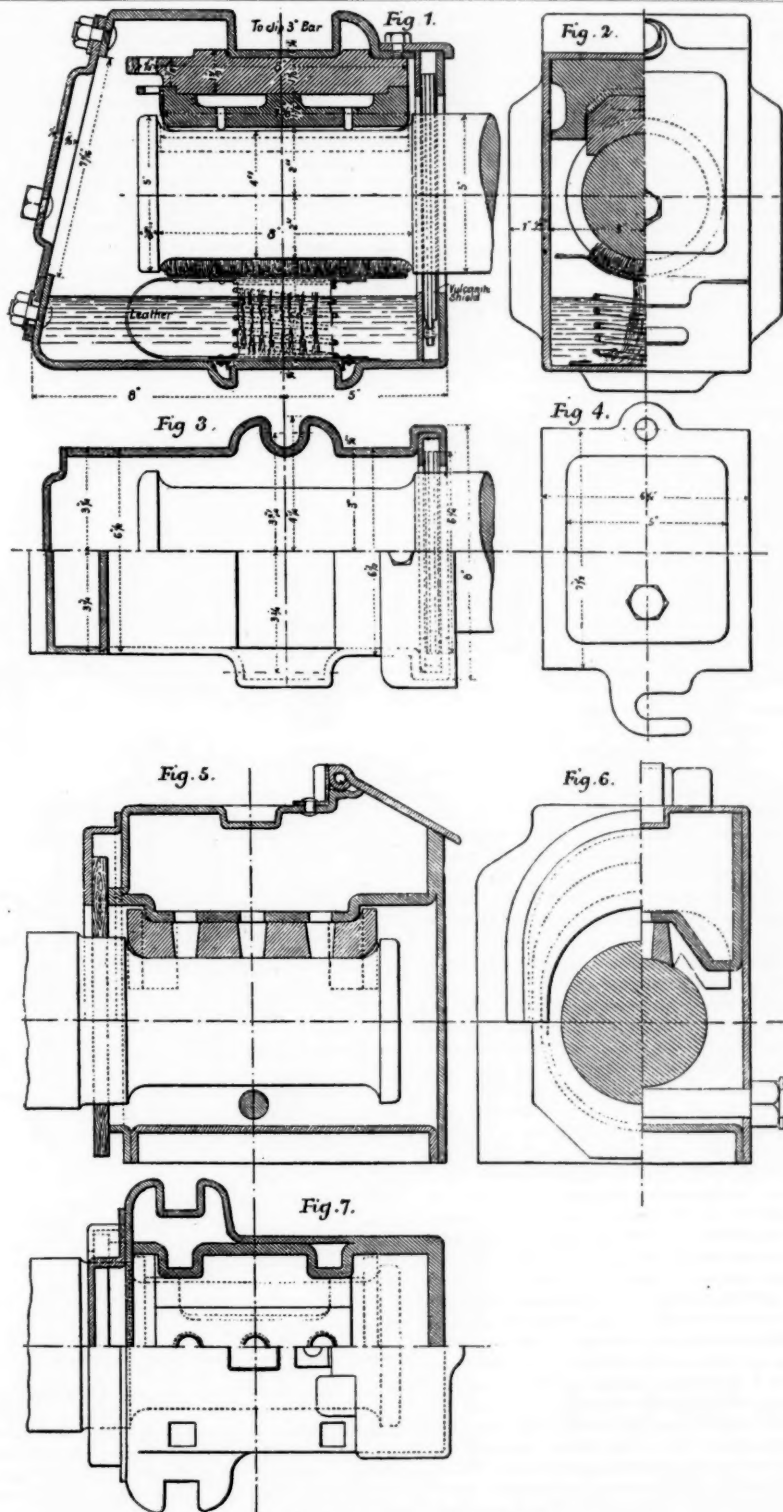
Referring to figs. 1 to 4, it will be seen that this is an oil box, fitted with a greasing pad and spring (fig. 2) in the usual way. The box is made of plate $\frac{1}{4}$ in. thick; its upper part is filled with a cast-iron slipper in which the brass fits. The opening in the box is covered with a stamped door (figs. 1 and 4), which turns on a stud.

Figs. 5 to 7 show a grease box. The inner grease container is made separately, and is afterwards welded in place. The metal for the outer box is first punched out of the flat sheet, the whole box, except the removable bottom, being in one piece; the process of stamping then follows, and gradually the recess for the spring, the grooves for the plates, and the other projections appear as the plate is passed from press to press. It is, however, still in the flat. It is then put into a folding press, which bends down the two sides and then folds the ends of them over to form the ends of the box. The shell is then complete, except that it has an open joint from top to bottom at each end. Each joint is closed by holding it in a powerful jet of mixed gas and air supplied by a blower. When it is raised to welding heat it is placed under a pneumatic hammer, a few blows from which complete the job.

The internal grease box is made much in the same way, but is a simpler job. It is placed inside the outer box, and the two are welded together round the hole through which the axle passes, and round the edges of the opening closed by the cover, that is, wherever the puncture is visible. The bottom of the box (fig. 5) is made separately, and is bolted in its place. (In figs. 1 to 4 the bottom is made in one with the box). The brass is dropped into its seat, and the whole is complete.

As a test a wagon was fitted with boxes of this description, and for several hours was violently shunted by an engine. No harm happened to the boxes, although other parts of the vehicle suffered. Indeed, it is difficult to see what could befall a box of this description, beyond, perhaps, a bruise which could be easily taken out by a smith. It is very light and exceedingly elastic, while the thinness of the plate enables the heat to dissipate readily, and thus not to waste the grease by undue melting.

The extreme lightness of the stamped boxes to which



STAMPED STEEL AXLE BOXES.

we have just briefly referred to is a very important feature. It weighs about one-third as much as the ordinary cast iron box, and the estimated saving in weight on the freight cars of the United Kingdom is about 100,000 tons.

Fastening Rails to Ties.

BY C. C. WRENSHALL, C. E.,

Chief Engineer and Superintendent Anniston & Montgomery Railroad.

Why in this "age of improvement" do we continue to spike down our rails to the cross-ties? We know that spiking will not hold a rail vertical on curves, that it is ruinous to the tie, that it is not a secure fastening as against the oscillations and impingements of heavy equipment moving at high rates of speed. Yet we persist in spiking down our rails flat footed to the ties on fully ninety per cent. of our total railroad mileage. It must be the force of habit or custom; it may be from thinking that if spiking down was good 25 years ago to hold a 4-in. rail to pass a 20-ton locomotive at 20 miles per hour, it must be equally good to hold a 5-in. rail steady against the poundings of a 50-ton locomotive at 50 miles per hour. Yet surely spiking rails belongs to the old time card, that showed on its face hand brakes, link-and-pin couplings, ties at 25 cents apiece, and section labor 75 cents per day. All of these are now changed, but we still spike down because it is cheap in first cost, and its ultimate results, destruction of cross-ties, amount of section labor required, spreading of track, springing of guard rails, creeping of track, causing switch points to be out of fit, and stub switches to jam tight, and track bolts to break—all are accepted

by the average operator as being quite the legitimate and proper thing. If the wrecks occur at the proper season, that is to say in very hot, or very cold, or wet seasons, nothing is thought of it. If they occur inopportunistly there will be a change of section foreman, or may be a roadmaster will be offered up as an appeasing sacrifice—that is all.

Taking our average mileage, east, west, north and south, I think that when an average oak tie has been bought, inspected, loaded, shipped to a division, distributed on sections and piled, then taken to place, old tie removed, new tie put in, tamped and surfaced, there has been expended upon that change about \$1.10, and the tie will render service for 10 years as an average result. At the expiration of that time the wood will have become "soft," and the rail seat will have become more or less decayed and cut down, and the tie will be a subject for consideration as to renewal. Had we put on a good tie plate when it was laid, we would have added five years of service life to it by expending 50 cents additional first cost. We can operate without tie plates at a cost per year of 11 cents per tie, and bear with all the mishaps and annoyances belonging to that old time method, or we can operate with tie plates, costing 50 cents per tie, at a cost per year of 10% cents, and have as clear profit safety to trains, reduced cost of maintenance of \$50 per mile per year, and the tie plates paid for and left on hand in service to save still more money.

If we allow one good set of plates to have sufficient durability to outwear two sets of ties, which is surely a conservative comparison between wood and heavy plate metal, then we have to figure upon a period of 30 years

—without plates we shall expend on ties and their renewals \$330 per mile per year; with plates we shall expend \$270 per mile per year. This is my conservative simple summing up of the general features of the question—we can expend 50 cents per tie for good tie plates, and by so doing save \$60 per mile per year over and above the cost of the plates. That would seem to be a fair business proposition to any one.

Then comes up the question, What constitutes a good tie plate? What is required; is it simply something to prevent rails from bedding down into a tie, or something that will in addition to a hard surface also dispense with present dependence upon spikes and with the use of rail braces in any form? When the rail is laid in place it must be held there absolutely tight, with neither vertical nor longitudinal movement; not simply when first laid, as in the case with spiked track, but it must be tight at all times, and the wear and consequent looseness and rattling must be provided against. We know that rails confined to ties by spikes set along the edge of the rail base do make severe wear upon the side of the spikes, and we know that rails when laid upon wooden ties creep, and we also know that we shall have the same objectionable results to a still greater extent if we place the rail on a smooth hard metal surface and depend upon the same style of fastening to control it. I do not see that we may reasonably look for any general adoption of tie plates until we have given up the use of spikes in connection with them. It makes but little difference in the destructive results whether we use Jones' or Brown's or Smith's specialty in spikes—they are all destructive to the tie. The Eads and Flad results obtained by boring and putting in a round bodied spike were not injurious to the timber, and gave good resistance in pulling; but the method is not accepted as practicable. To suggest the general adoption of plates to preserve tie surface and to arrange the plates to be secured with spikes, which carry decay and death to the heart of the tie, will not be readily accepted as a good money investment by road officers who prefer to trust to their practical observation rather than to printed testimonials as to the highly beneficial and entirely harmless qualities of Smith's, Jones' or Brown's specialty.

I notice that Sandberg proposes to plant his 100-lb. section on bed plates showing some 100 in. surface area to prevent cutting down into soft wood ties. My own observation as to action of heavy steel versus light steel in plates does not lead me to agree with Mr. Sandberg's conclusion as to surface area required. I presume that his "Goliath" section represents to him so much increase in weight of rolling stock, and so much additional pressure per square inch to be carried by the tie surface, to meet which, and produce no more damage to the tie surface than was produced by the tonnage of which his 80 lb. section was the equivalent, requires a large area to be brought into service. If this is the general basis of his assumed requirement of 100 sq. in. area, I should differ as to the conclusion arrived at. There is no law or parity between the requirements of a medium weight rail carrying equipment fully up to its capacity and the requirements of a heavy section under the same relative conditions. Medium weight rails are much more destructive to the ties than heavy sections. The difference in width of base in the 100-lb. versus the 60-lb. section is of itself of material benefit to the tie in giving to the rail lateral stability and preventing rolling in its seat on the tie; and the wave undulations under heavy steel carrying heavy equipment are measurably longer waves than those under light steel carrying light equipment. This indicates that the waves climb over each tie more abruptly under the light steel, and it is this climbing up over the edge of the tie and getting down across the other edge, aided by the rolling of the rail laterally in its seat, that does the larger share of the cutting down into the tie, and these results exist more markedly in light track than in heavy track. I have taken a piece of steel $2\frac{1}{2}$ in. wide, 1 in. thick and 8 in. long, and placed it as a tie plate on the tie under 65-lb. steel traveled by 60-ton locomotives, kept that tie surfaced up a little "stiff," and at the end of 60 days the plate only showed its own impress in the surface of tie; the indentation could not be detected by touch with the finger end; and yet it was only a soft (tamarack) wood tie. Putting three such plates side by side on a tie (one on each edge and one on the centre line) caused the tie to roll in its bed, as the tamping stood away from the upper face line of the tie on each side, but the tie with the single (centre line) plate did not roll. From this one may infer that tie plates may be too wide for either good results or economy. As to length, I had a lot of plates made which were 12 in. \times $\frac{1}{2}$ in., and put them under 60-lb. steel. These plates sprung up on both ends and kept their spikes slightly pulled. I then had 100 plates of rolled steel, same dimensions as to surface, but $\frac{3}{8}$ in. thick. These plates sprung under loads, but came to a level surface again; neither set showed any impression on the tie surface. But it was practically an unsatisfactory result, as I could detect a distinct depreciation in the quality of the wood under the wide plates at the end of 18 months' service. I judge that the wide plates take wet under them to the very centre of the plates by capillary attraction between the two surfaces, and inject the moisture into the tie by the

"slapping" under passing wheels, and as plates become very hot under direct sun rays (I think as high as 150 deg.), the tie is injured by the constant changing of its surface condition. It is wet and cold every morning, even in dry weather, by precipitation on the plate, and then baked at 150 deg. for, say, four hours. These are not the conditions to be desired to insure a good result in tie durability. A moderate-sized plate, say 4 in. \times 8 in., will give the best results on a tie with a face of 8 in., and a 5 in. \times 9 in. plate will give a good general result on a tie with a working face of eight to ten inches. Moisture quickly works out to the edges of such plates and evaporates. The ties they are upon lie quiet without rolling in their ballast, and if the ends of the plates are held down firmly to the tie, so that heavy loading

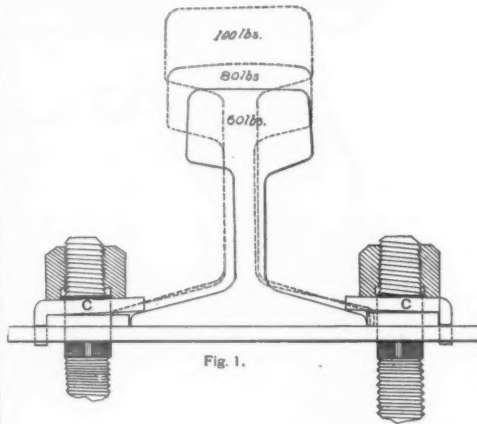


Fig. 1.

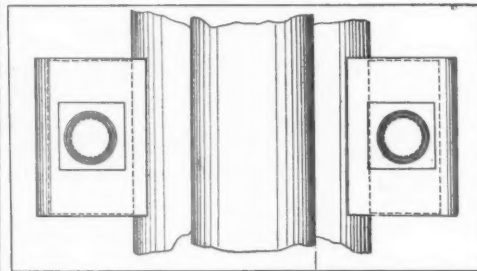


Fig. 2.

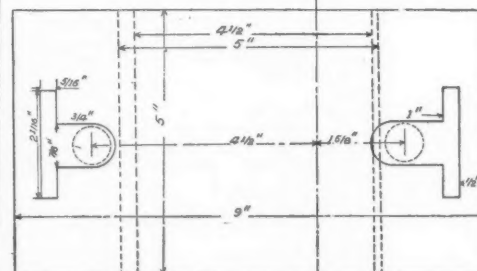


Fig. 3.

Wrenshall's Tie Plate and Rail Fastening.

on the middle will not cause the ends to "cock up," you may rest assured that a five by nine plate will carry all the load that will come upon it, and the heavier and deeper the rail the better will be the ultimate results to the tie. Until we eliminate oscillations of equipment and its result in lateral rolling of rail, improve our road bed as to solidity, increase our number of ties per mile, and the section of rail beyond our increase of weight in equipment so far as to eliminate wave motion, we need not establish it as a rule that if a rail of 65-lbs. worked to its capacity required a plate of, say, 7 in. \times 9 in., a rail of 100 lbs. section will require a plate of 8 in. \times 12 in.

As the question to what constitutes a tie plate that would be a judicious purchase by a railroad that is just getting its growth, and may be using 60-lb. steel to-day and 80-lb. in 1900, with, may be, an intermediate service of 70-lb., it should have as one of its features ready and economical adaptability to receiving in the same plates any size of steel from 60 up to 100 lbs. without taking the plates off the ties, let alone having to throw them aside with the old steel. A second point should be that spiking should not be a feature of securing the rail and plate to the tie, for it would lack consistency to suggest to the road operator that he should adopt tie plates as a tie saver, and then arrange to have him use as fastenings of rails and plates to his ties, spikes which he knows from dearly bought experience to be tie destroyers. The fastenings must not only be harmless to the tie, but of such character that they can be removed and replaced in the same holes, and be, beyond all question, just as efficacious as when first placed and the design of them simple and mechanical. By mechanical I mean something whose value as a hold-fast can be figured upon as having so much holding power and requiring no special statements to impress one with the belief that it will hold.

It is a common practice for trackmen to pour sand into old spike holes, and for trestle and bridge men to plug

old holes with wooden plugs, and then drive the spike into the filled holes. The results are about the same: the sand goes into dust very quickly and leaves the spike free, and the wooden plugs having their side grain, which is comparatively soft, exposed to the compression between the sides of spike and the hardened fibre of tie, soon become mere shells without holding elasticity. If the men would pour coal tar into the old spike holes and drive the spike in the tar they would get a good result in every way at no more trouble or expense. Coal tar poured into an old track spike hole liven up the fibre, stops decay and takes hold of a rusty spike in a very satisfactory manner. In very cold weather the spike may be dipped into the tar and driven, in place of filling the hole; but filling the hole, so long as the weather will permit of the tar being poured, gives a better result. Coal tar only costs about two cents per gallon, but section and road gangs despise having to carry it with them or to use it, whereas filling old holes with sand is clean work, and the splitting out of little soft pine plugs is really a pleasant job for road carpenters at \$2.50 per day. I have used coal tar in this way, and on pile heads and bearing surfaces of trestling, for 25 years now in construction and maintenance, and found it has a very good effect on everything except the temper of the men applying it.

If the use of full tie width plates should in the evolution of equipment become desirable, the upper surface of the tie and the under surface of the plate should be given a coat of hot coal tar. As a practical fact, however, careful observation, extending over a period of some 30 years in construction and maintenance, causes me to believe that a plate 5 in. wide will give the best working results. I have by me drawings of plates designed by me in 1885, and again changed in 1887, and again in 1889, so the question as to what is required in a tie plate to make the purchase of them a well-balanced outlay is not a new line of thought nor a hasty departure on a new "fad." I have "been there" practically and mentally for some years, and having been in charge of some thousand-and-odd miles of working track for several years, and having no interest in any make or form of plates other than the total amount of benefit received for so much outlay, I feel at liberty to entertain opinions on the tie plate and rail fastening question, and that opinion is that a tie plate should not cover more than one-half of the face width of the tie it is placed upon, and that it should not be longer than is required to carry good, simple and positive rail fastenings without the fastenings being exposed by contact to wear and damage by rail movement. Fastenings must be of such character that they will continue to produce pressure upon the upper face of the rail base by being susceptible of adjustment, so that whether the tie be new and hard and dry, or old and shrunken and soft, that fastening must be acting on the rail base at all times with a force of about 5,000-lbs. pull, to draw the rail and plate and tie together, and thus prevent creeping and rattling. The inside of rail fastening must be capable of resisting an upward lift of the rail base equivalent to 20,000 lbs. per plate, and thus prevent turning over of the rail by impingements of wheels at high speed or during derailment. The fastening should be removable at pleasure and go back into the same place, and be beyond all question just as effective after many removals and replacements as when first placed. Plates must not be let into the tie surface in any way, neither must the fastenings injure the tie either in its strength or durability. The under surface of the plate should be perfectly flat on their cross section, so that rain water and moisture from condensation may escape readily. The fastening should be of such character that the rail may be removed from the plate readily without removing the fastening in the tie or loosening it, and the entire plate and fastenings so designed that they may be placed under working rail without lifting the rail or depressing the tie so much as to require the fastenings in the adjacent ties to be loosened. Finally the cost per tie for the plates and their fastenings should not exceed the money value of the increased life given to the tie by their use.

The form of tie plate and fastening shown herewith is given as the result of a good deal of study. The plate is stamped out of $\frac{1}{4}$ -in. rolled plate, and the clips and fillers are also stamped out and there is no machine work on them. They weigh five pounds per plate, and the bolts as shown, cut "Harvey grip" thread, weigh two pounds per plate. I estimate that the complete plates will cost 40 cents per tie. These plates at 40 cents per tie would dispense with the cost and use of spikes and rail braces, and they will outlast two or three sets of ties and take in any change of steel from 60 to 100 pounds.

The illustration shows the whole arrangement with sufficient clearness. The screw bolts are $\frac{3}{4}$ in. diameter, and I have a simple wrench designed to put them in. The spring clips and fillers make the adjustment perfectly simple for sections of any weight between the limits given. The spring clips C C, fig. 1, do not rest on the plate, but on the fillers, the plate being slotted, as shown in fig. 3.

Car Heater and Hose Coupling—Martin Anti-Fire Car Heater Co.

The car heater shown herewith has been devised to prevent danger to cars from fire in case of a wreck when a fire is used to heat the water. It consists of an

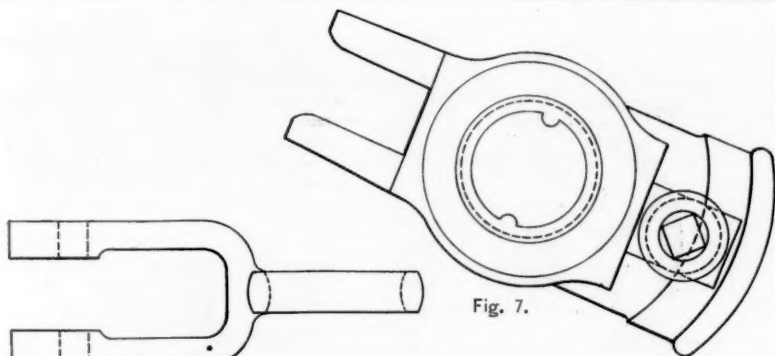


Fig. 7.

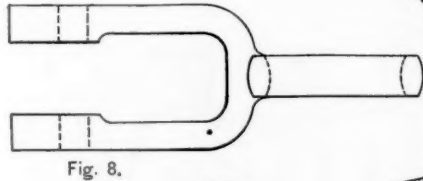


Fig. 8.

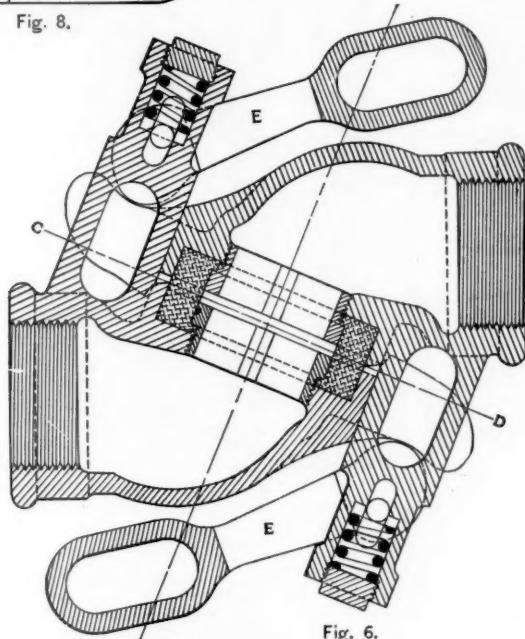


Fig. 6.

MARTIN STEAM COUPLING.

outer shell of wrought iron riveted up in the form of a boiler, with heads at the top and bottom.

Fig. 1 shows a section of the heater with hopper closed and the grate in position. Fig. 2 shows the external shape and appearance. In this figure the ash pit door can be seen. Fig. 3 shows how the hopper stick is guided, and also the location of the holes through which the gases pass to the chimney. Fig. 4 is a plan of the grate, and fig. 5 a section through the heater, showing clearly how the steam coil is located. The coal or wood fire is placed at A on the cast iron grate shown. The flame passes upward around the spurs of pipe B, and out at the chimney as usual. Coal is fed into the hopper C through the cover D; this cover being operated by a handle which extends through the side of the heater as shown. There are two shells to the heater, and between them the water is circulated. In the water space is placed a steam coil as shown, into which the steam from the train pipe passes. All parts of the shell being made of wrought iron of considerable thickness, there is no danger of its being shattered in a wreck.

The steam coupling is automatic and, having the steam passage at only a slight angle to the general direction of the train pipe, it offers but little resistance to the current.

Fig. 6 shows two of these couplings in a coupled position with the levers thrown into the locked angle. Fig. 7 is an end view of one of the couplings and fig. 8 a detail of the lever. This coupling parts on the line C D, where can be seen the packing and the screw washer which holds it in position. In coupling the faces are placed against each other, no grinding action taking place, and by turning the lever E into the position shown the cams on the ends of those levers are caused to act against small springs, as shown, thus holding the coupling faces tightly together. In case of a break in two of the train this coupling parts automatically. The details of construction of these devices are clearly shown in the illustration. They are made by the Martin Anti-Fire Car Heater Company, of Dunkirk, N. Y.

Wooden Trestle Bridges.*

BY WOLCOTT C. FOSTER.

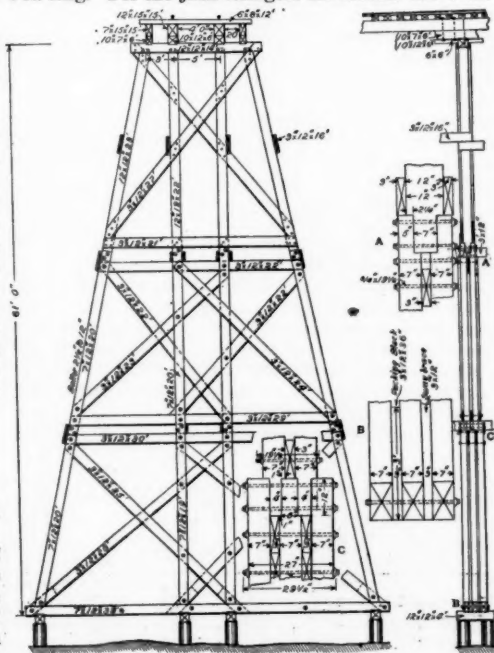
Double and Triple Deck Trestles on Extensions of the Milwaukee & Northern Railroad.

The cuts presented with this article show the style of construction as adopted on some of the extensions of the Milwaukee & Northern Railroad for double and triple deck trestles. Mr. S. B. Fisher, the Chief Engineer of this road, claims for these trestles that any member can be removed and replaced, if found defective, without taking down the bent. Also that the timber seasons better to be cut in such sections than if cut larger.

* Copyright 1890, by W. C. Foster, and condensed from his forthcoming book upon the same subject.

It will be noticed at once that there is no guard rail, and consequently the remarks on the subject made when describing the trestle illustrated in the *Railroad Gazette* of June 13, 1890, will apply with equal force to this case. The ties are of good dimensions, but the stringer system could be very easily improved. The use of jack stringers to support the ends of the ties is very commendable, and they are of excellent proportions. It is different, however, with the track stringers. It would be far better were each track stringer composed of two 7-in. x 15-in. pieces or even two 6-in. x 15-in. pieces than to consist of a single 12-in. x 15-in. stick as at present. It is hardly necessary to enter into a discussion in this place as to why split stringers are far preferable to solid ones, as many of the reasons are obvious. In fact the very advantages claimed by the designer for the structure as a whole, as his reasons for adopting this style of trestle will also apply to the use of split stringers.

The stringers are supported on corbels 10 in. thick and 6 ft. long. For the jack stringers the corbels are 7 in.



Double and Triple-Deck Trestles,
MILWAUKEE & NORTHERN RAILROAD.

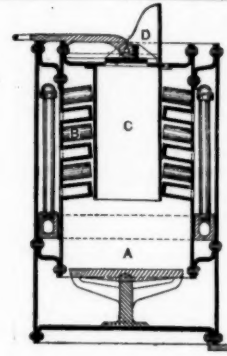


Fig. 1.

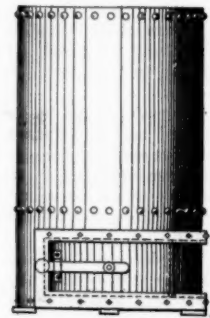


Fig. 2.

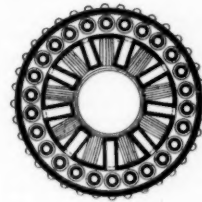


Fig. 4.



Fig. 5.

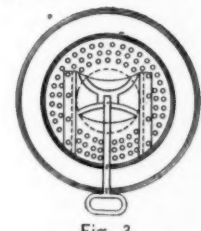


Fig. 3.

Martin Combination Heater.

wide, and for the track stringers 12 in. The stringer and corbels are firmly bolted together by $\frac{3}{4}$ -in. bolts. The corbels are notched over the caps.

The cap of the top story consists of a 12-in. x 12-in. x 14-ft. timber. The posts of this story are single sticks of 12-in. x 12-in. timber, which are joined to the caps by mortise and tenon joints. The tenon is $2\frac{1}{4}$ in. x 5 in. x 10 in.

The posts of the second story consist of the two 7-in. x 12-in. timbers each, separated 3 inches. The method of joining the posts of the top and second stories together is shown in the enlarged detail A.

The posts of the lower story are each made up of three pieces of 7-in. x 12-in. timber separated 3 in. The details of their joints with those of the story above are shown in the enlarged sketch C. The lower ends of the posts are notched into the sill, the details of the joints being shown enlarged at B. The blocking and sway bracing act as tenons attaching the posts and sill together. The sill, which consists of three pieces, rests upon subsills or pile caps 12-in. x 12-in. x 4-ft., over which it is notched. These pile caps are each supported upon two piles and are placed directly beneath the foot of each post. The sway bracing throughout the entire structure, both horizontal and diagonal, is of 3-in. x 12-in. plank. The longitudinal bracing is also of like dimensions.

A notable feature in this trestle is the lateral bracing placed immediately beneath the floor system. It is an excellent thing, and adds very considerably to the stiffness of the structure.

When the bent is under 45 ft. in height the outside posts are given a batter of 3 in. per foot. For heights greater than this the batter is reduced to $2\frac{1}{4}$ in. per foot. The bents are spaced 15 feet between centres.

Following is a bill of material:

Name	BILL OF TIMBER.	Size.
Floor System.		
Ties	6 in. x 8 in. x 12 ft.	
Track stringers	12 in. x 15 in. x 15 ft.	
Jack stringers	7 in. x 15 in. x 15 ft.	
Track stringer corbels	12 in. x 10 in. x 6 ft.	
Jack stringer corbels	7 in. x 10 in. x 6 ft.	
Top story		
Cap	12 in. x 12 in. x 14 ft.	
Posts, battu	12 in. x 12 in. x 23 ft.	
Posts, plumb	12 in. x 12 in. x 22 ft.	
Sway bracing (diagonal)	3 in. x 12 in. x 27 ft.	
Sway bracing (horizontal)	3 in. x 12 in. x 21 ft.	
Second story		
Posts, all	7 in. x 12 in. x 20 ft.	
Sway bracing (diagonal)	3 in. x 12 in. x 22 ft.	
Sway bracing (horizontal)	3 in. x 12 in. x 23 ft.	
Sway bracing (horizontal) (Upper)	3 in. x 12 in. x 24 ft.	
Sway bracing (horizontal) (Lower)	3 in. x 12 in. x 22 ft.	
Third story		
Posts, battu	7 in. x 12 in. x 20 ft.	
Posts, plumb	7 in. x 12 in. x 19 ft. 8 in.	
Sill	7 in. x 12 in. x 39 ft.	
Sway bracing (diagonal)	3 in. x 12 in. x 25 ft.	
Sway bracing (diagonal)	3 in. x 12 in. x 28 ft.	
Sway bracing (horizontal)	3 in. x 12 in. x 30 ft.	
Subsills	12 in. x 15 in. x 4 ft.	
Longitudinal bracing	3 in. x 15 in. x 16 ft.	
Lateral bracing	6 in. x 6 in.	

BILL OF IRON.

Double deck trestle.	
Bolts	30-194 in. x $\frac{3}{4}$ in.
Spikes	4-224 in. x $\frac{3}{4}$ in.
Triple deck trestles.	
Bolts	18-194 in. x $\frac{3}{4}$ in.
Spikes	4-224 in. x $\frac{3}{4}$ in.
	30-294 in. x $\frac{3}{4}$ in.
	128.

Duplex Boring Machine.

This machine is designed for boring two pump cylinders at one time, and while the centres are fixed they can be built different distances apart to suit requirements.

The platen is fed by a nut and a screw driven by a $2\frac{1}{2}$ in. feed belt. The power feed can be run either way without shifting the driving belt by the change gears that are operated by the lever shown over the right hand corner of the door. The feed nut can be thrown in or out of contact with the screw by one turn of a small crank.

The platen has a hand feed admitting of a quick return for counter-boring, and has a 14 in. travel. The knee that supports the platen can be raised and lowered and securely bolted to the face of the column by two $\frac{3}{4}$ in. bolts, with heads fitted to the "T" slots in the column. The spindles are of steel. The main journals are $3\frac{1}{2}$ in. in diameter and 6 in. long. The rear journals are $2\frac{3}{4}$ in. in diameter, 5 in. long, with a $1\frac{1}{2}$ in. hole running through; the ends are bored to receive the cutter bars, or other tools, size 2 in. at the large end, and $1\frac{1}{2}$ in. at the small end, and 12 in. deep.

On the top of the machine a $4\frac{1}{4}$ in. bar of hammered steel projects to receive the centre support for the ends of the boring bars when needed.

The platen is 16 in. wide and 20 in. long, with "T" slots for attaching angle plates or other work to be done.

The machine is driven by a three step cone, the large one being 14 in. in diameter, and having a $4\frac{1}{2}$ in. face. The machine is back-gear 4 to 1, giving ample power for heavy cuts. The weight is about 4,500 lbs. This machine is built by Messrs. Pedrick & Ayer, Philadelphia, Pa.

Steel Section Car Wheel.

As is well known to our readers, Messrs. Fairbanks,



Morse & Co. make a large variety of hand and push cars. Their combination steel and wood wheel for section cars is also well known to the public. The web is of hard maple, the tire of pressed steel and the hub forged steel. They are now manufacturing a new form of wheel, which is shown in the accompanying cuts. The flange, tread and web are pressed from a single piece of steel. The steel hub is riveted to the web, as is shown in the cut, and there are no bolts. The steel is

turned over to make a flange off the M.C. B. standard thickness, and thus do away with the danger which exists, with the extremely thin flanges common on hand-car wheels, of taking the wrong side of a point.

There are no spokes to get loose, and as is seen by the illustration the wheel consists of but two parts and six rivets. While this wheel is especially recommended for very dry climates and for all climates subject to great variations in the degree of humidity of the atmosphere, its simplicity must make it durable in any climate. It is also a very light wheel, weighing but about four pounds more than the combination wood and steel wheel made by the same house.

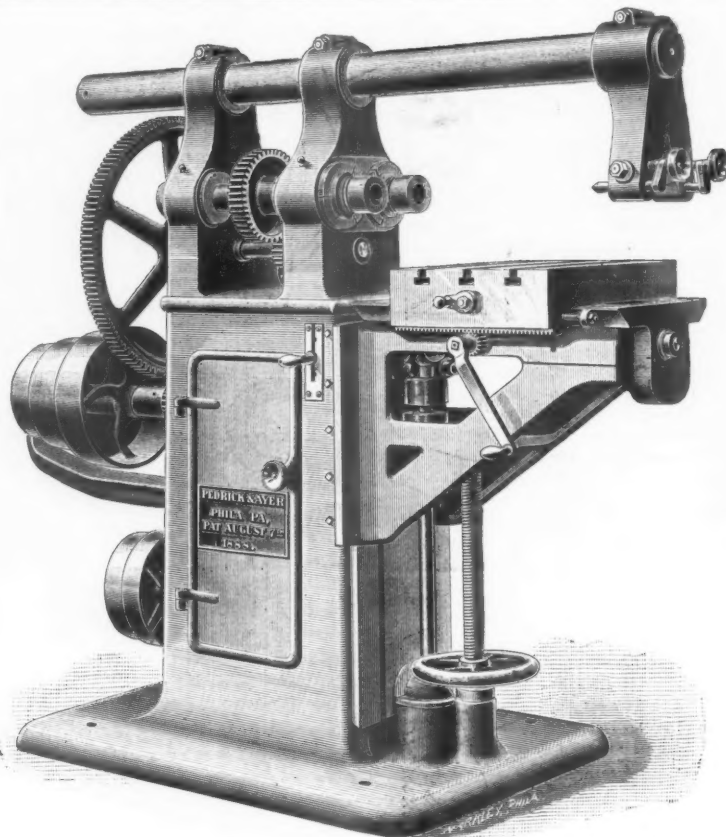
July Furnace Capacities and Probable Production of Pig Iron.

The last number of the *American Manufacturer* returns the total weekly capacity of furnaces in blast on the 1st inst. as 178,695 tons, as against 181,953 tons on June 1, the capacity being smaller than for any month since February. On the other hand, the capacity of furnaces in blast July 1, 1888, was 115,672, and on the same date last year 132,408 tons. By multiplying the capacities by the number of weeks, the only method of judging of our production until Mr. Swank's returns are received, it will appear that we have produced for the first half of the year 4,641,605 gross tons, as against an actual production of 3,661,003 tons for the same time last year. The significance of these figures is increased by the fact that there is no knowledge of any large stock of pig iron on hand, and as the price has been maintained slightly above the average for the past two years both circumstances point to a conclusion that most of our increase output has gone into consumption.

This probability seems so important that it is worth while to notice the relations which have obtained between the predictions based on the furnace capacity returns of the *American Manufacturer* and the returns of half-yearly production by Mr. Swank, which have been as below in gross tons:

By furnace capacities.	1888.	Actual production.
1st half.....	3,170,019	3,020,092
2d ".....	3,375,859	3,469,646
1889.		
1st half.....	3,550,116	3,661,003
2d ".....	3,901,936	3,943,039
1890.		
1st half.....	4,641,605	

From which it will be seen that unless our furnace men have been seized with an acute attack of boasting, against



DUPLEX BORING MACHINE.

Built by MESSRS. PEDRICK & AYER, Philadelphia, Pa.

which the editor of the *Manufacturer* is powerless, there is no warrant for estimating the output at less than four and a third million gross tons.

These figures, if they are as close an approximation as those preceding them, will amply justify the prediction in the *Railroad Gazette* made at the close of the last year—that we would take the place of England as the chief iron producer of the world in the course of a year or two. And what is more satisfactory, considering the small mileage of new railroad constructed this year, they indicate an unexpected power of consumption in the country that can only be accounted for by supposing great industrial activity.

The Projected Jungfrau Railroad.

Last fall there appeared, about the same time, two plans for a railroad to the summit of the Jungfrau. Of the two projects the one of Herr Trautweiler, of Lucerne, is described in *Engineering*.

We give the gist of the plan in his own words: "For a railroad running to a height of over 13,600 ft. there is demanded a design which is not affected by storm, avalanche, or land slip. Therefore it is necessary that we confine our operations to the interior of the mountain. The whole arrangement for forwarding passengers in tunnels presents itself then as an ordinary problem in which engineering science is no novice." The profile of the mountain, which from the valley of Lauterbrunnen, 2,670 ft. above the sea, rises abruptly to a height of 13,670 ft., is most favorable to this plan, as the tunnels are not inordinately long and auxiliary shafts can be driven at convenient places to lighten the labor of removing the rock, etc., and serve as a means of beginning operations at several points at the same time.

The line will begin about two miles from Lauterbrunnen, at Stegmatten, 2,850 ft. above sea level. The total length of line is 21,000 ft., and the total rise is 10,700 ft. The road is divided into four sections, with a station at the end of each. At the last station, some 120 ft. below the summit, as well as at the others, shafts varying from 70 ft. to 350 ft. in length will be driven leading into the open air at comparatively sheltered spots, and thence footpaths to the nearest points whence the best views can be had, will be made. The following table gives the data of the four sections:

	Lower station, height above sea.	Length of tunnel.	Upper station, height above sea.	Rise.	Rating gradient.
First tunnel....	Feet. 2,850	Feet. 4,530	Feet. 6,070	Feet. 3,220	Per cent. 98
Second ".....	6,070	6,040	8,530	2,460	40
Third ".....	8,530	6,170	11,940	3,410	39
Fourth ".....	11,940	4,720	13,550	1,610	37
		21,460		10,700	

The first tunnel, though the shortest, is by far the steepest, rising at an angle of almost 45 deg.

The section of the tunnel is comparatively small,

height, 8 ft.; breadth, 7 ft. 5 in.; area, 59 sq. ft. As lining, cement blocks 8 in. thick are proposed, so that the total area of material to be removed is 71.5 cu. ft. per foot of tunnel length. The breadth of the profile admits of room for a man to pass outside the rails, on each side, while along gradients of over 50 per cent. steps will be hewed out of the rock, and at convenient intervals niches will be provided so that the members of the staff who are compelled to go over the line on foot may be able to rest. In the middle of each section a double track and switches will be laid for a short distance so that the carriages will be able to pass each other.

It is proposed to use cable traction. The power is to be obtained by erecting an air-compressing plant at a point on the Sefinen Luetschina, about $1\frac{1}{4}$ miles from Stegmatten, where there is a considerable volume of water. From the compressors mains will be laid to the upper station of each tunnel section and the air there employed to rotate a drum in the usual way.

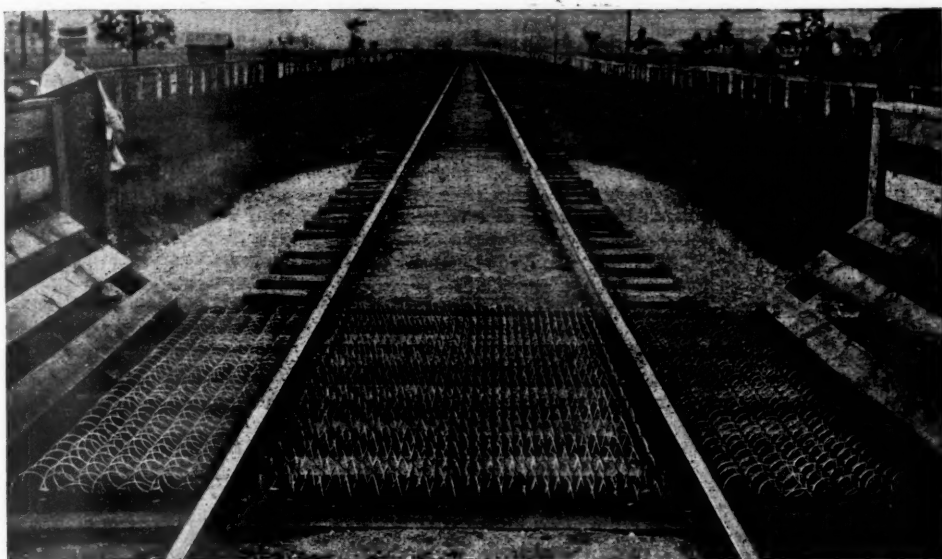
In operating gradients of 98 per cent., the necessity of instantaneously acting brakes is plain. To this end it is proposed that the carriage act as a piston and the tunnel as a cylinder, and as this cylinder is closed at each end by air-tight doors, it is seen that by regulating the flow of air or leakage past the piston the speed of the carriage can be controlled. At each end of the carriage side-wings moving on hinges are to be fixed. On these wings are fastened flexible plates of leather, india rubber, or a similar material, so that when standing normal to the length of the carriage they almost fill the space intervening between the carriage and the masonry. At the roof and floor are similar wings, fixed to the carriage framing. The adjustment of the side wings can be made by means of a hand wheel fixed upon a spindle projecting toward both sides, and provided with right and left-hand threads, having nuts not rigidly connected with the side wings, but acting on them by means of the compression of a spiral spring. The wings are first adjusted by the guard, but should the speed begin to increase the air forces the wings still further open till the acceleration ceases.

A recent communication from Herr Trautweiler gives as his opinion that with the "piston" air brake the rack rail may be dispensed with, for with strongly constructed carriages and brake gear the traffic would be absolutely safe and at the same time much lighter.

The estimated total cost of the road will be not less than £240,000, and the construction will require six years.

Steel Surface Cattle Guards.

The surface cattle guard which is shown in the illustration has recently been introduced by the Kalamazoo Railroad Velocipede & Car Co., Kalamazoo, Mich. It will be seen that it is made in three sections; the widest one to go between the rails and the others to cover 2 ft. and 2 in. of the roadway on each side. The length of the guard in the direction of the axis of the track is 9 ft. The guard is made of wire webbing of $\frac{1}{4}$ in. galvanized steel spring wire. This is woven on frames of $1\frac{1}{2}$ in. angle steel. The frames are stiffened by $\frac{3}{4}$ in. round iron rods.



STEEL SURFACE CATTLE GUARD.

The coils of wire are 4 in. in diameter, with $3\frac{1}{2}$ in. pitch. The ends of the wires are fastened to the frames with $\frac{3}{8}$ in. bolts and special washers, into which the ends of the wire are fitted.

It is claimed for this guard that it is light, strong, elastic and durable, and that it will effectually turn stock either large or small.

It is not necessary to go into the general question of the advantages of a surface guard. This one presents many of them in high degree. If in use it proves durable and effectual; it will be a strong competitor in a field in which there is a great deal to be done.

Locomotive Testing.

BY H. G. MANNING.

In undertaking the test of a locomotive, to obtain conclusive results as to economy of boiler and cylinder it is necessary to obtain with the utmost care the following general data: duration of tests; weight of coal burned; percentage of ash; weight of water fed to boiler; Quality of steam (per cent. of moisture); temperature of gases in smoke box; horse power developed.

In my opinion the beginning of the test should be taken as the moment steam is admitted to the cylinders to start the train from the terminal station. From this on, to the end of the test, the time should be noted, whenever steam is shut off or admitted again to the cylinders. The end of the test should be taken as the time when steam is shut off on going into the last station of the run. From this duration must be deducted the minutes steam has been shut off while running into and standing at stations, or from any cause. Care must be taken to have the condition of fire, height of water and steam pressure as nearly alike at the beginning and the end as practicable. The above times are taken as the duration, for the reason that it is during this period alone that the locomotive is doing its intended work, namely, pulling a train. I hold that the quantity of coal used to start and bank a fire is immaterial to the main question, How much coal is burned to a horse power per hour, or how much water is evaporated per pound of fuel under running conditions? The weight of coal and water used during the above time represents as nearly as I believe it possible to obtain, with a locomotive, the quantities needed for our general data as to how a locomotive performs in service. The weights of coal and water used over and above these in a round trip show how much is required to take care of the engine when off duty. There appears to be nothing serious in the way of taking the duration in this manner, for the fire can be started and made ready for the run with a small quantity of coal on the tender. A few minutes before starting the tender can be entirely cleared and a weighed quantity, sufficient for the run, dumped in. A careful fireman would have his fire in such shape that during 15 minutes before train time no coal need be put upon the fire. At the end of the run the coal remaining must be weighed back. Finally, the ashes should be spread out and thoroughly dried, and the unconsumed coal picked out. The percentage of this ash to the total coal burned is important in determining the value of the coal as fuel.

The height of water at the beginning of and during the test should be taken from a glass gauge on the boiler butt, care being taken to bring the water to the same mark at the end of the test as at the beginning. The weight of water used cannot be easily or quickly obtained, accurately, without the use of a meter on the tender of sufficient capacity to supply the injectors. A float or glass, arranged to show the height of water in the tank, must be placed in the centre of area of the water space, otherwise the position on grades, curves and canting track admits only of an approximate indication of the average height of water, and in the experience of the writer the swashing water always disturbs

the correct reading of a glass in any position. A glass placed in the centre of area would in most tenders come in the coal space. After testing a meter and correcting the readings for a definite quantity run through, we have only to take its readings, without regard to the leakage of the tank or the position of the tender. At every stop the water readings should be taken, as one reading will check another, and any error will be detected.

During the test, steam should not be allowed to escape through the safety valves, and an intelligent engineer and fireman can manage this with care. This escaping of steam is the one element in tests of this kind, which is wholly unknown, and no correction can be made for it unless a blow-back valve be used, in which case calorimetric tests, entirely out of place, would be needed. Hence the only remedy is not to let the safety valves blow.

The waste of water from injector overflow is appreciable on a long run, but by averaging the quantity wasted at several startings and noting the number of times the injector is started during the test, an approximate correction for this waste can be made.

The weight of water or steam used by the air pumps is not to be neglected, and for practical purposes it is sufficient to obtain the number of strokes made during the test. This can be done by using a common revolution counter, attaching the driving rod by means of a friction plate to the piston rod of the pump between packing nuts. By ascertaining the volume of steam used at boiler pressure and deducting the corresponding weight of water from that used by the engine, we will have an approximate result which will not affect appreciably the general results.

The waste by the blower is difficult to charge up, but the quantity of steam lost from the engine account in this manner is so slight as to make no appreciable difference in the results.

Locomotive tests usually leave out the important factor of the quality of the steam delivered to the cylinders; the evaporation of water per pound of fuel is therefore too high, compared with results from a stationary boiler, where the rate of combustion per square foot of grate surface is barely 10 per cent. of that in the locomotive. Therefore no figures as to evaporation per pound of fuel on a locomotive can be called approximately correct unless the per cent. of moisture in the steam taken from the steam pipe near the chest is obtained. There is nothing to hinder obtaining this, for a simple calorimeter can be arranged on the front end, the cooling water being led from the tank. As no two locomotives will prime alike or carry over through the dry pipe the same per cent. of water mechanically mixed with the steam, so the results from two engines cannot be fairly compared unless this quality of the steam is determined.

As the temperature of the gases in the smoke arch is directly connected with the economy of a locomotive, so no test is complete which disregards it. A carefully adjusted pyrometer, capable of registering 1,000 degrees, should be placed in the passage between the dividing plate and the bottom of the smoke arch, a vital part of the draft appliances of the straight stack and extended smoke arch.

In obtaining the horse power developed indicators should be attached by three-way cocks to both ends of each cylinder. The most convenient, safe and expeditious place for them is upon the top of the steam chest, having piping arranged with as short connections as possible, not, however, sacrificing length and long, easy curves to pipes having elbows and short bends. In the writer's experience the length of piping, whether from the sides or the ends of the cylinders, does not affect the correctness of the diagram. The cord movement for indicators should be obtained with a pantagraph or pendulum motion attached to the crosshead.

Cards should be taken from each cylinder at the same time, as frequently as every 30 seconds, by operators having nothing else to attend to. This is as often as it is practicable to obtain an accurate card and keep up the work in a test of three or four hours' duration, but is not any too frequent for correct results, as in no class of engines does the power vary so often as upon a locomotive. For high speed indicating, the common form of revolution counter does not give satisfaction, and I would recommend the use of a drum (similar to that on an indicator) run by clock work and making a revolution in not less than 3 seconds. The axis of this drum should be parallel with the boiler and the steam chest cover, the movement of the drum being at right angles to that of the indicator cord movement. By attaching a rod to the cord movement so as to obtain from $\frac{1}{8}$ in. to $\frac{1}{2}$ in. travel, and having a pencil connection at the drum, a series of V's will be made on the paper wound around the drum, and if the drum is run for exactly one quarter of a minute, the number of revolutions is accurately shown by the number of V's. By suitable stopping and starting catches this counter will do the work correctly.

During the test four operators are necessary, stationed as follows: one in the cab to note the time of taking the card; the steam pressure; the position of the throttle and the reversing levers; and the tank meter readings. One at each indicator for taking the cards only. One on the front end to take the revolutions and the data from the calorimeter. These four can obtain all the data necessary for a thorough test. A less number increases the chance of error. With a properly constructed guard around the front end there will be plenty of room for three to work conveniently.

SUMMARY.

Duration.—Time of leaving first station, to time of shutting off steam for last station, minus the number of minutes steam has been shut off between first and last stations.

Coal Burned.—Weight of coal placed on tender just before starting from first station, minus the amount weighed back at last station.

Percentage of Ash.—Per cent. of ashes during duration to total coal burned.

Weight of Water.—From meter readings checked for any difference in heights in glass at beginning and end.

Quality of Steam.—Obtained from calorimeter data.

Temperature of Gases.—From pyrometer in smoke arch.

Horse Power Developed.—From indicators and revolution counter.

From these data can be deduced any items pertaining to this class of tests. The most important are:

1. Pounds of water evaporated per pound of coal.
2. Average horse power developed.
3. Average horse power developed per hour.
4. Average pounds of coal burned per horse power per hour.
5. Average mean effective pressure.

In selecting an engine on which to make such a test it is best to take one which has been in regular service long enough to have valves and seats and cylinder packing in good condition. Tests should be made before starting to see in what condition are the valves, etc.

No test of one engine can be called complete until tested in different classes of service, such as on express, accommodation, suburban or freight trains. We should expect better results from the boiler and the engine on the express than on the accommodation, and expect the poorest from the suburban train, where, from the frequency of stops, the power varies so often.

It is necessary to make the tests on the same train with the same cars in the same class of service for six days at least, or certainly until results show so nearly alike as to practically check one another.

Strikes and Other Disturbances.

The strike of freight handlers at Cincinnati seems to have failed, most or all of the roads affected having succeeded in getting enough men to move their freight in a tolerably satisfactory manner. The freight handlers of the roads centering in Toledo struck last week, but seem to have failed of their object, as most of the roads got men from outside the city. The yard brakemen of the Louisville & Nashville, at Louisville, stopped work last week, but on Friday the company agreed to investigate their grievances and make a reply in ten days, and the men went to work. The Kentucky Central had a strike at Louisville, but compromised with the men, and they resumed work. At Indianapolis, the differences between the Cleveland, Cincinnati, Chicago & St. Louis and its yard employes have been settled by the company meeting the demands of the men. Yard brakemen and firemen receive an increase of from 15 to 25 cents a day. The Baltimore & Ohio has discharged 90 men from the shops at Newark, O., and 150 at Bellaire, O. The shops at Caldwell, O., have been closed. The Chicago & Northwestern has ordered the discharge of 200 men from the Chicago shops, and will, it is said, make reductions at other points on the system. A Birmingham paper says that both the Queen & Crescent and the Louisville & Nashville have increased the wages of their yardmen in that city. Press dispatches report complaints from engineers and other classes of employes on a number of roads, and conferences with managers at various points, including one with President Ingalls, of the Big Four, at Indianapolis. Mr. Ingalls told the men, when they spoke of referring their complaint to a federation, that no outsiders could settle differences between his road and its employes.



Published Every Friday,
At 73 Broadway, New York.

EDITORIAL ANNOUNCEMENTS.

Contributions.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

Advertisements.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

The condensed time tables of the Pennsylvania system, printed in the *Official Guide*, showing the through car lines and the connections of through trains, which have long been among the most elaborate and carefully prepared of any time tables with which we are acquainted, have now been made still more convenient for the hurried or inexperienced reader by the addition of outline maps prepared especially for each table. For instance, the time table of through cars between St. Louis and New York City is illustrated by a map showing the route of those cars by a heavy line, with the other roads of the Pennsylvania system shown in lighter lines, and those of connections lighter still. These maps are got up by the passenger department of the lines west of Pittsburgh, and there are sixteen of them, accompanying the time tables on as many different pages. Without them, the reader desiring to trace his route on the map would be obliged to constantly refer back to the full-page map at the beginning of the Pennsylvania tables. The new maps are 2 x 4 1/2 in., and are not only admirable in themselves, but by their use the compiler has been enabled to make the language of his tables clearer. As those familiar with these tables know, the wants of the traveler in the principal cities on the Pennsylvania lines are very fully provided for. A person starting, for instance, from Terre Haute or Dayton for New York City is not obliged to look up his time on a schedule in which his starting point is a mere way station, but is provided with a table specially prepared showing that city as a terminal. In one sense this may sometimes be a disadvantage, as it spreads the information for a given territory over a good deal of paper. In the case before us, 16 pages are taken for tables which many readers would prefer to see shown in eight, or even four pages. Hardly any document covering more than two pages is complete without an index, and a brief statement in the nature of an index, by which one could get, at a glance, an idea of the contents of these 16 pages would be a further improvement. The fact that these special tables are somewhat of a novelty is, however, one of the reasons why this feature is noticeable, and we will not hold it up as a fault. Work of this kind is so much needed that we hope passenger men will study its excellences rather than hunt for its faults. We have many times urged the preparation of time tables by which travelers could select routes with less aid from experts and are glad to see examples of it. It is to be hoped that lines that are shorter and non-competitive will not be overlooked in making improved tables. Many routes of this sort are used by large numbers of passengers, and it is needless to say to experienced passenger men that it pays to please patrons whose business does not have to be fought for, as well as those whom it is deemed absolutely essential to do with "taffy."

It is a good rule to always ride in the safest part of a train. It is doubtless rather childish to lumber up one's brain with the fine-spun theories of some traveling men that a certain seat in a certain car at a certain relative position between the middle and the rear of a train is the least liable to accident, and to make special efforts to always secure that seat, but yet there

are obvious reasons for keeping well away from the opposite extreme. Our readers will recall a recent instance of two employes who were killed on a locomotive, and who would doubtless still be alive if they had been at their respective posts of duty. The superintendent at once forbade employes to ride on engines unless their duties required it. Nearly all questions get before the courts sooner or later, and this one came up in a case before the Maryland Court of Appeals, which is reported in our law column to-day. A postal clerk off duty and riding home on a pass rode in the mail car and was killed. It is no doubt pleasant to ride in the company of one's acquaintances rather than to spend a dreary hour or two in a passenger car, trying to get an unsatisfactory nap or spending the time in profitless conversation, but when one makes a choice in a matter of this kind, deliberately placing himself in the more dangerous position, he should fully recognize the possible consequences. A mechanical man will often like to ride on the locomotive in preference to the most luxurious palace car, but when he does so he will do well to remember that "accidents happen in the best regulated families," and that there are more chances that they will happen on the engine than in a well-built passenger car.

The vexed question of whistling for crossings has more than one side, more than three even; probably more than a hundred. The blockheads who are constantly engaged in a strenuous endeavor to get themselves or their wagons struck by locomotives (and thus have the fun of going to law with the railroad), must be considered; and so must the quiet people who stay at home and want the engines to let them do so unmolested, or who, when they travel, are content with a gate to keep them off the track, an electric bell to keep the gateman to his duty, and a bell-warning from the locomotive as an extra precaution. To fully satisfy both these classes is impossible; and we regret to observe that most superintendents give the careless wayfarers the benefit of the doubt. This is the easiest course, as engineers can be got to whistle excessively much more easily than they can be trained to be careful and moderate in the use of that signal; and after a jury has given a verdict of \$3,000 to a man who brings 500 "witnesses" to testify that they did not hear a whistle at a certain time, this seems the prudent as well as the easy course, and the Superintendent enters upon the vain attempt of furnishing ears for those who won't hear. We did not set out, however, to give a general discussion upon this subject, but merely to make note of a case before the New York Supreme Court, reported in our Law column, wherein a road, by whistling, got into trouble with one of the very class who generally demand liberal whistling. When an engine is half a mile away wayfarers want it to make all the noise possible, not giving a thought to the hundred or thousand people in the intervening territory whose tympanums must suffer from the passage of the blast; but when the engine gets up to them, and repeats the outrageous noise for the crossing half a mile further on, they change their tune. This is only one illustration of the difficulties connected with this question; but, along with others, it goes to show the futility of trying to make crossings safe by increasing the uproar around them. There are a good many cases where it would be well to abandon the allopathic for homeopathic principles. The "mild power is best," except that a crossing gate should never be anything milder than oak.

The case referred to in the Kentucky law reports, where the rear portion of a train which had parted was run in the night without a light in advance, illustrates the duty of trainmen to take special care for the protection of human life, even where that duty might seem not to be incumbent upon them, strictly speaking. It does not appear whether the train in question broke accidentally or was cut in two for the purpose of taking or leaving cars. The victim had no right on the track whatever, and yet where the right of way is unfenced, and people are known to use the track as a footpath, regard must be had for their safety. Indeed, a light or a bell (or both) on the foremost car of a switching train (or in a case like this) should be invariably employed, if for no other reason than the protection of employes, or persons rightfully walking on or near the track. We noticed recently on the Pennsylvania lines in Pittsburgh a man on top of the foremost of a string of cars (being pushed by a switching engine) swinging a large hand bell. The first impression was that of the approach of a yeast peddler or a scissors grinder; but any one can at once see that this is a good common sense practice, whatever ludicrous ideas it may present.

The Interstate Commerce Commission and Grain Rates.

The most important matter now pending before the Interstate Commerce Commission is the proposed order reducing grain rates. Within the week the rumor has been started and denied that the Commission will issue an order, as proposed in the call for a hearing issued June 16, and as outlined in its report of June 7. We had hoped that the order would not be issued. We learn, however, that the Commission will issue an order reducing rates from Nebraska, Kansas and Missouri to Mississippi River points and Chicago, and that it will probably appear this week. Our authority for this is the best. The present rates east of Chicago are not considered excessive. We regret that this step is to be taken. The official "report and opinion" itself has probably done more to injure the standing of the Commission before the serious and influential men of the nation than any other document it ever issued. An order such as is proposed would still further weaken the influence of the Commission. The method of conducting the inquiry and collecting the evidence, the quality and tone of the discussion in the report, and the apparent failure on the part of the Commission to realize the result of carrying into effect its "findings and conclusions," all combine to strengthen the opinion that the whole movement is "political." We do not believe that this opinion is just, but nothing could be more unfortunate for the Commission itself than to have it prevail. Up to this time the purity of the motives of the Commission has never been seriously questioned. Such influence as it has had has followed from the belief that its purpose was honest. But if the contemplated order is issued many intelligent and thinking men will distrust the motive. From that time the end of the Commission's influence begins; from that time its power for good or harm will decline. So far as the public is concerned, it may be questioned whether this is or is not a desirable result; but in the minds of the Commissioners as a body there is probably no question. Whatever the effect of the order on the personal fortunes of the Commissioners, its effect on the future of the Commission will be disastrous.

Irrespective of any theory of the true basis of rates, the order outlined in the report will be for the Commission most impolitic. It will certainly be contested in the courts and will probably be found unconstitutional. That is, the citizens owning the railroads would be deprived of the use of their property without judicial investigation, or "without due process of law." The effects of the proposed reductions will be so tremendous that it will be vital with many of the companies to resist them to the end.

Not only will the railroads have good ground for contesting the order on the irregular and *ex parte* nature of the proceedings on which the Commissioners' conclusions are based, but it will be surprising if they could not show that the conclusions themselves are wrong. The Commission has decided that the present rates from the Missouri River to Chicago and to the Mississippi are excessive and should not exceed 17 and 12 cents. But the "ascertained facts" on which this decision is based are mainly that rates for like distances are much higher west of the Mississippi than east of Chicago, and that, under stress of competition, the roads have carried grain for less than present rates. The report recites many other facts more or less irrelevant and more or less hypothetical, but these are the controlling ones. There is no indication of a scientific and exhaustive investigation, by both parties to the question, of specific rates and of their basis, and of the effects upon all interests of a compulsory reduction of them. The rates decided upon by the Commission as the maximum are, so far as one can judge from the facts and arguments given in the report, mere guesses. In making them the Commission will take upon itself the burden of proving not only that they are high enough, but that they are not too high. To justify them before the courts will require a very different process of proof and reasoning from that followed in the report.

What we have said applies merely to the question of the policy of issuing the order as affecting the Commission itself. It does not take into consideration the broader question of the wisdom of any attempt to fix maximum rates by law. For reasons which we have often given, such an attempt is always sure to do more harm than good. In the present instance it would probably result, if it could succeed, first in reducing the cost to the consumer (unless the Commission can fix a minimum price to be paid for wheat and corn), second, in diminishing the railroad facilities now enjoyed by the producer, and finally, in immense, if not irreparable, damage to the producer, the carrier and the consumer.

Some Mistakes in Dealing With Men.

The Chicago strike, which we discussed two weeks ago, was one in which justice was overwhelmingly on the side of the railroad company. If the strikers had any valid grievances against Mr. Russell they completely neutralized them and alienated public sympathy by their rash way of presenting them. But in this and other respects this strike was exceptional, and of a kind which we may hope is not likely to recur on any large scale. In most disputes there are pressing for settlement important questions concerning the relations between railroad companies and their employes, and it is the duty of all concerned to contribute, as far as possible, toward securing such settlement on an intelligent and equitable basis. It is much to be regretted, however, that some of the most important of these questions not only never come to a settlement, but they fail even to get a decent discussion that does anybody any good. Some of these we wish to discuss for a moment.

Demands for higher pay or for more work are constantly being made, and they are settled or compromised in all sorts of ways, but nothing instructive results. A stubborn fight "to the finish" like that on the Burlington in 1888 is the rare exception. Generally each side has to yield something, and, as between the contending parties, the agreement is doubtless perfectly honorable; but the absolute right and wrong is not settled. It is true that strikes are to be regarded in very large measure as a natural and inevitable feature of the relations between capital and labor, and that they are not to be abolished by mere words or by any sleight-of-hand; but hopeful people have looked for at least some improvement in the methods of dealing with them. It is here that failure is evident in nearly every prominent dispute. A simple demand for more money, if plainly just, is acceded to; and, if plainly unreasonable, is followed by the discharge of the men and the engagement of new ones in their places. But if employes demand a change of hours or of work, exemption from a color-blind or a reading and writing test, or from an examination on their general intelligence; if managers demand a surrender of independence or of cherished "rights," which after all are such only in a modified sense, the side that surrenders acts from only the most short-sighted "expediency." Frequently the parties are so thoroughly ashamed of their respective positions that they allow none of the negotiations to become public, if they can help it, thus depriving their brethren on other roads of the valuable lessons concerning the art of reaching "amicable adjustments," which might be learned from their doings. Therefore it is that employers and employes go on talking and writing about the ethics that should govern these matters, the goodness of being good and the badness of being bad; and editors go on editing this sort of stuff, while the first actual case that comes up is settled on precisely the same principles that govern in buying a dinner when one is half starved. Strike the best bargain possible, but make some kind of a settlement at once.

Two or three recent instances illustrate our point. On a prominent Western road, a few weeks ago, the manager declined to treat with the officers of an "organization" about grievances of employes, but after the newspapers had spread broadcast a statement that the men threatened to strike, the news came that their demands had been acceded to; but whether the manager swallowed his principles or the employes moderated their demands is a question that is kept exceedingly quiet. Railroad officers all over the country are frequently voicing the sentiment that a corporation should not be dictated to by representatives of men who are not its employes; but when it comes to a test they seem to back down, or at least assume such a modest demeanor that people naturally believe that they have given in.

The yard trainmen at Pittsburgh a few weeks ago advised the public, through the Associated Press, that they had serious grievances and that the railroad companies held all sorts of unjust views; and some of the railroad officers were reported as vigorously maintaining their independence of labor organizations. Chiefs and Grand Chiefs and Great Grand Chiefs assembled at Pittsburgh, but the final outcome was as conspicuously unheralded as was the subsidence of the Mississippi Valley flood. Why so many manifestoes and "claims" about a matter whose settlement is of small concern?

The Central of Georgia (and apparently the two other most prominent roads entering Atlanta) recently asked some of their employes for information with which to fill up a personal-record book, and among other things sandwiched in the following questions:

7. State if insured. In what companies and for what amounts?

10. State if discharged from service, as above, cause, and from what road?

11. State where last employed, capacity, time and cause for leaving?

14. Were you ever discharged from this road; for what cause, and when?

10. Will you abstain from the use of intoxicating drinks while in the service of this company?

20. Will you keep away from places where it [intoxicating liquor] is sold, and lend your influence to help others do the same?

Do you know that some of the bridges, including highway bridges and tunnels, on this road will not clear a man standing on a box car, and also that it is dangerous to climb up the side of a box car, by the regular ladder or otherwise, while the trains are moving?

There was a "kick" at once, of course. Numbers of the engineers neglected to fill out the papers, and a conference was held at Savannah, Mr. Arthur being present. The next thing was the announcement of a compromise, arrived at by "the withdrawal of the circular and the substitution of a new contract in the nature of a compromise. The Brotherhood of Engineers agrees to assist the road in keeping incompetent men out of the service, and to furnish all information in its possession about any employe when called upon by the road to do so." Apparently all other classes of employes gave the replies without urging. Whether the company concludes that it doesn't care where the men are insured, does not regard avoidance of drinking places as of such special importance as it did, and no longer deems a notice to trainmen concerning low bridges essential, we are not told; but apparently it has withdrawn not only the unreasonable paragraphs, but some of those whose aim is good, as well. The resulting influence is likely to be bad.

If prominent roads, with the most experienced officers, cannot reach a rational agreement with their men about the personal dangers of freight train work, other roads will give up trying. If trying to find out whether a man has been discharged on another road is an unjust procedure, weak-kneed superintendents will conclude to rest contented with states-prison birds for brakemen, assuming that an elevation of the morale of the men is an impossible task. If a deliberate conference seems to decide that it is wrong for the superintendent of a road to know about his men's drinking habits, the likelihood that a dull minded (we will not say drunken) engineer will some time run past a danger signal is increased.

"Be sure you're right and then go ahead" seems to be a forgotten maxim. Circulars are issued and sent forth much like starting a snow plow in the dark on a road that has not been used for a week. Whether the whole expedition will not go into the ditch at the first cut is an appropriate question, but one which receives far too little consideration. The responsibility for illogical settlements between railroads and their employes rests on the officers rather than on the employes, for the reason that, aside from direct demands for more pay, the employes are generally in a position to ask simply to be let alone. Their demand is a negative one. In asking for better service the superintendent is the aggressor, so to speak. It is his fight, and he is responsible for success or failure in bringing forward sufficient force to win it. And as a defeat of one division demoralizes the whole army, it is a great waste of time and energy for the managers of an important road to begin a movement without first amassing the power and the determination to carry it through. The manager who says he will not treat with a body of men of whom a part belong on some other road should stick to his determination. If his men are determined to negotiate only on such a basis, he should discover the fact in season to keep his mouth shut. If agitators from other roads are harmful and ought to be squelched, he should either take a stand and drive them out or else stop boasting. While a brotherhood officer, as such, may deserve to be frozen out, quite likely the same man, when properly presenting himself as a representative of the company's employes, deserves the most considerate attention.

There is no use in trying to prevent employes from combining with those of other roads, even if it were right to do so, which it isn't; but if it is desired to have your men ignore such affiliations when talking with you, a little diplomacy should be used to induce them to do so. Such ignoring is often mere "make-believe," on both sides; but as that sort of mild self-deception is not without its uses, it is not to be summarily condemned. It is diplomacy that has preserved agreeable relations between the Brotherhood of Engineers and scores of companies during the past dozen years, and if railroad managers would use a little more of it taking the initiative, it would be well for them. This power is profitable too in dealing with others than engineers; and, moreover, should result beneficially for both sides, whatever the class of employes.

The topics in the questions printed above are all fair, ones for discussion, but any one can see that they cannot be successfully handled by machine methods in an

"independent" country where the comic papers fill up whole issues with "jokes" on the government census. If one would make men *promise* how they will behave when off duty, he should make the bargain before hiring them, unless he is fully prepared to dismiss them when they refuse. If their behavior off duty is already dangerous to their efficiency when at work, it is high time that something more than a promise be secured. If a manager finds himself with a lot of whiskey-drinking engineers whom he has engaged with his eyes open, he had better prove a few cases against them and bring matters to a head. If employes' life insurance is a matter that concerns the employer, he had better invent some method of getting them to tell him about it freely; no information of value can be got by coercion. If a man has been discharged by another company, it should have been found out when he was engaged. If he has been discharged on your own road and you do not know it, it is a question whether the fact is worth recording.

That paragraph about dangerous overhead bridges is similar to one on another road, alluded to in these columns some time since, wherein trainmen were warned against defective cars, etc. No reasonable person can question the substance of these matters; it is the manner of putting them that makes the trouble. The Louisville & Nashville prints a list of low tunnels, and cautions its men against butting their heads against them. We never heard that this list made trouble. If it is necessary to get men to acknowledge in writing that they have read such a notice, they should be approached when they are good natured; not after they have been irritated by a question which they think impertinent. Still more is this true if you desire men to do you a favor by acting as missionaries among their fellows when off duty. Railroad officers and their acts are now so sure to be exposed to "the fierce sunlight of publicity" that it behooves them to make no mistakes. It is profitable to spend much time and money to avoid them. The whole question of the relations between a railroad company and its employes is one which needs time for its settlement, and the greatest need of many roads is therefore a consistent policy. The unfortunate results of many of their acts may be attributed in large measure to the evidently spasmodic character of those acts. Employes' demands for additional pay may be said (though in a limited sense) to be settled by the law of supply and demand, but employers' demands for better service require more skill.

A chief cause of poor service on railroads is the fact that in the expansion of business, officers have been given charge of a larger number of men than they can properly handle. Different people propose different remedies for this evil, but no one has invented any substitute for the old rule, that to get a man to do any duty he must first be told how to do it; second, tested to see that he knows what has been told him, and, third, watched to see that he actually does it. It is true that from 40 to 99 per cent. of the men will know without being taught, or will be faithful without being watched, but the rule must be carefully applied for the purpose of reaching the remaining 60 per cent. or less. Just as soon as this is done the officers will become so well acquainted with their men that the present clumsy methods of learning how faithfully the work is being performed will be unnecessary, and most of the causes of disputes will be removed.

Railroad Mileage, Population and Area Here and in Europe.

The statistics of the world's railroad mileage, which we recently reproduced from the *Archiv für Eisenbahnen*, give opportunity to make some interesting comparisons. It will not be new to our readers that the population per mile of railroad is much less here than in any European country; but this is a fact of prime importance, and the following table will enable us to make comparisons with many other countries, as well as with Europe as a whole:

POPULATION PER MILE OF RAILROAD.		
Australia.....	375	Great Britain..... 1,908
Canada.....	394	Belgium..... 2,010
United States.....	423	Austria-Hungary..... 2,632
All Europe.....	2,635	Spain..... 2,921
Sweden.....	1,015	Italy..... 3,985
Switzerland.....	1,571	Russia (in Europe)..... 5,034
France.....	1,745	India..... 18,000
Germany.....	1,891	

Thus the small population per mile—the fullness of the supply of railroads—is common to the two great British colonies and this country, and is even more marked with them than with us, and may be regarded as natural to a rapidly growing country with vast areas of fertile but uncultivated land.

The mileage in proportion to area, of course, is vastly different, but it is less important, and in large countries has little significance, unless accompanied by a comparative view of the physical geography of the different parts of the country. An average for a country which

includes a vast area of desert or of uncultivable mountain ranges may give a very erroneous idea of the railroad equipment of the inhabited or uninhabitable parts of the country, as in British America, for instance. Still, in the United States there are continuous territories where the mileage is greater than in equivalent areas anywhere in Europe. Belgium is usually cited as having the densest railroad system. It has just 3,000 miles in an area of 11,370 square miles, or a mile of railroad to 3.79 square miles of area. This is a smaller area per mile of road than in any of our states, of which Massachusetts has 3.99 and New Jersey 4.08 square miles per mile of road; but an area as large as Belgium could probably be found near Philadelphia and Chicago, and perhaps also near Cincinnati, Pittsburgh and New York, which would contain more than 3,000 miles of railroad.

If we take any considerable area in Europe, however, we shall nowhere find the railroad network so close as it is here. France, Germany, Belgium and Holland form a contiguous territory with a higher cultivation, more developed industries, and a denser population than can be found in any other territory of equal extent. Now, these four countries have in the aggregate an area nearly the same as that of the United States north of the Potomac and the Ohio and east of the Mississippi—that is, as far west as and including Illinois and Wisconsin. Now this part of the United States had 56,052 miles of railroad June 30, 1888, while the four European countries six months later had 52,124 miles, with a slightly greater area, the figures being:

	Miles of R. R.	Area, sq. m.	Sq. m. per mile of R. R.
U. S. north of Potomac and Ohio and east of Miss.	56,052	431,940	7.71
France, Germany, Belgium and Holland	52,124	437,632	8.39

The opinion seems to be general, here as well as in Europe, that in the old country the mileage in proportion to area is much greater than here, which the above statement shows not to be true. If we substitute Great Britain and Spain for Germany, thus taking all western Europe, we shall have 460 more miles of railroad, but also 107,000 more square miles of area, which would increase the area per mile of road in the European territory. In no way can be formed in Europe a continuous district as large as this northeastern section of the United States with so large a railroad mileage, except by cutting off the eastern part of Germany and putting Great Britain in its place.

To compare with the kingdom of Great Britain, we may take Massachusetts, Rhode Island, Connecticut, New York, New Jersey and Pennsylvania, which have

	Square miles.	Miles railroad.	Sq. miles per mile of railroad.
Massachusetts	116,755	18,799	6.21
while Great Britain and Ireland have			
Square miles.	121,478	Miles railroad.	Sq. miles per mile of railroad.
		19,812	6.13

That is, the density of the railroad system is very slightly greater in Great Britain. If for the three small New England states in the above we substitute Ohio, we shall have an area about one-sixth greater than Great Britain, in which there will be a mile of railroad to 6.36 square miles of territory. In either of these the Adirondack region of New York may be set off against the Highlands of Scotland, but fortunately we have nothing to set off against Ireland.

If, however, we take England and Wales alone, which form a compact territory only a little larger than the state of Illinois, we shall find one mile of railroad to 4.21 square miles of area. This we cannot match with any equivalent area which has so large a railroad mileage, not to say railroad traffic, nor probably could it be matched elsewhere in the world. If anywhere, it would be in a territory including Belgium, Holland, and a part of Germany near the Rhine, where great iron and coal industries have, as in England, required an exceptionally close network of railroad.

Having compared the parts of Europe and America which have the densest population and the most railroads, we will now take another and much larger territory, in the United States, the whole area as far west as and including the Dakotas, Nebraska, Kansas, Indian Territory and Texas—that is, all east of the Mississippi River and the two tiers of states next west of it—and in Europe all except Russia. These two territories have:

	In Europe.	In United States.
Miles of railroad	114,792	128,146
Area in square miles	1,739,000	1,828,000
Area per mile of railroad	15.32 sq. m.	14.25 sq. m.

The two territories are nearly equal in area, but that of this country has a decidedly greater railroad mileage and a considerably denser railroad system.

The area of the part of the United States west of the above-named territory is three-eighths less than that of Russia in Europe if we exclude Alaska, and one-sixth less if we include Alaska; but it has one-sixth more railroad than Russia.

We will now compare the whole of Europe with the whole of the United States.

	Europe.	United States.
Miles of railroad	133,000	149,992
Area in square miles	3,830,000	3,547,000
Population	350,592,000	63,437,000
Per mile of railroad:		
Square mile of area	28.8	23.7
Population	2,635	423

The railroad mileage of the United States is that given by the Interstate Commerce Commission on June 30, 1888, and is 6,180 miles less than is given by the *Archiv* for the end of that year.

We see by this that this country, arctic Alaska included, with about 8 per cent. less territory than Europe and less than one-fifth of its population, has 12½ per cent. more railroad, that it has a fifth more railroad for an equal area of territory, and but one-sixth as many inhabitants per mile of railroad.

How is it possible that we should be able to support six times as much railroad as Europeans for the same population? Partly by having a great deal of transportation, due largely to the fact that most of our industries did not begin until the age of railroads, and have been developed in connection with railroad transportation, which alone has made it possible that one district should obtain a large or the chief part of even its coarse supplies from another district one or two thousand miles away; while in Europe necessity, long before the days of railroads, compelled such a distribution of industries as would enable every district of a hundred miles square or so to be nearly independent of the rest of the world; and this old distribution of industries, though greatly modified, has by no means been destroyed by the railroads. But the chief cause of our extraordinary supply of railroads is the cheapness with which they are built and worked.

If they had been made according to the prevailing European standard the fixed charges would probably have been something like \$750,000,000, instead of the \$314,000,000 which was actually paid in 1887-88 (if the lines not reported paid on the average as much per mile as those given in the Commission's report); and it is hardly necessary to say that the business of the country could not have borne the burden of an additional 400 millions. Actually the average expenditure per inhabitant for railroad transportation was about \$16, of which about \$5 was for interest on the capital invested. As to cost of working, we can only estimate roughly what it would have been had European practice prevailed, but considering the enormously large force of employees required by that practice and the cost of labor in this country, it could hardly be less than \$200,000,000. That it might have been better if we had fewer miles of railroad and a better average construction and operation may very well be; but if 65 millions of people are to have 160,000 miles of railroad to serve them, they must have a cheap system, whether it be good or bad. A very large proportion of the greater cost of European railroads is due to expenditures whose chief object is safety. The avoidance of level crossings alone costs immense sums, as many of our railroad companies have recently had to learn, and it is safe to say that if our railroads had been compelled in the beginning to go over or under the streets and highways to the same extent that they do in France, not to say England, a large part of our lines could never have existed. These innumerable grade crossings cost hundreds of lives a year. But if the question came clearly before the public, that they must permit this sacrifice of life or go without such and such lines of railroad, we fear that the slaughter would go on. The Dakota man would be glad to have it stopped in Texas, but as for putting anything in the way of the Mouse River & Yankton Grand Trunk—why, it is going to be hard to get it built at best, and he has a lot of land and a promising town site on that line, and his fortune depends upon it.

In short, the enormous interest which the landholders especially in the newer states, have in the construction of railroads, which on the whole have certainly added to the value of land many times their own cost, causes a public opinion in favor of every new enterprise which is impatient of anything that many prove an obstacle to its completion—a public opinion which contrasts strongly and often ludicrously with that which is shown sometimes very shortly after the line is completed, and the effect on land values is beyond peradventure.

Railroad Construction in 1890.

The figures of the summary by states of new mileage laid in the first half of the year, published below, vary but little from the totals given two weeks ago, in connection with the detailed table. A column showing the miles of track under contract or construction in the various states has been added.

	Track laid.	Under con't.		Track laid.	Under con't.
Alabama	82.5	150	New York	4.3	145
Arizona Ter	3.3	...	North Carolina	165.4	448
Arkansas	64.	50	Ohio	7.	291
California	1.	41	Oregon	...	46
Colorado	35.	179	Pennsylvania	65.7	143
Florida	96.8	35	South Carolina	70.	81
Georgia	215.	250	South Dakota	1.5	16
Illinois	71.	27	Tennessee	151.5	103
Indiana	46	46	Texas	44.	91
Indian Ter	58.4	54	Utah Ter	2.	78
Kansas	57.3	25	Virginia	102.	63
Kentucky	74.	117	Washington	106.5	371
Louisiana	25.	123	Wisconsin	16.	83
Maine	12.	29	Wyoming	9.	258
Maryland	30.	97			
Massachusetts	1.5	...	Total	1,930.6	4,480
Michigan	46.1	166	Manitoba	7.5	94
Minnesota	2.	161	Nova Scotia	...	68
Mississippi	45.	60	Ontario	18.	...
Missouri	34.	144	British Col.	...	48
Montana	124.8	119	Northwest Ter.	48.4	107
Nebraska	70.	127	Mexico	241.	190
New Jersey	30.	73			
New Hampshire	...	33	Total, foreign	317.9	567
New Mexico	...	75	Grand total	2,248.5	4,987

The distribution of this new mileage in groups is as follows:

	Track laid. Miles.	P. ct.	Under con't. Miles.	P. ct.
New England and Middle States	120	6	426	10
Southern States (east of Miss.)	1,032	53	1,436	32
Northern States	133	7	469	10
Southwestern States	328	17	819	18
Northwestern States	209	11	672	15
Pacific Coast States	108	6	658	15
Total	1,935	100	4,480	100

It will be noted that the percentages of new road built and of that under contract differ more in the Pacific and Southern states than in the other groups. Probably the year's work will show that these figures indicate correctly the increased percentage of the total new track which will be found to have been completed in the Pacific Coast states, especially in Washington. The great railroad development of that state has no counterpart in the adjoining commonwealths. About 130 miles were laid within their boundaries last year, but as yet only about 50 miles seem likely to be built this year. The lines under construction in the Northwestern states east of the Pacific slope promise much new mileage, probably enough to place that group second in the list at the end of the year.

Nearly all the states have laid more track than at the corresponding period last year; but there are a number of exceptions to this: in New York the decrease has been from 85 to 4 miles; in Ohio from 54 to 7; in the Dakotas from 27 to 1½; in Texas from 112 to 44; in Missouri from 56 to 34, and in Mississippi from 140 to 45, but in this state all the mileage in the first half of last year was credited to one company. These states, it will be seen, are not in one geographical group, so that a suspension of construction through any particular section of the country is not shown.

The Burlington & Missouri River road, the Missouri Pacific, Northern Pacific, Union Pacific and the Rock Island, which laid new mileage last year west of the Mississippi River, aggregating 770 miles, are building this year over 1,300 miles of new road. This is in branches and extensions which are under contract, and though tracklaying may be delayed on some of the lines until next year most of the grading will be done before January.

The Great Northern line did very little work last year, but is now building over 100 miles in Washington under the charter of the Fairhaven & Southern. It has placed in England £2,000,000 of an issue of £6,000,000 four per cent. bonds for its long projected Pacific Coast extension, upon which it is proposed to begin grading this year. The Southern Pacific Co. last year built nearly 100 miles of road, of which 40 were in California. It is now building 40 miles in that state but has no other work under way.

East of the Mississippi nearly 500 miles of track was built last year by the Atlantic Coast line, Central of Georgia, Georgia Pacific, East Tennessee, Norfolk & Western, Georgia Southern & Florida, Richmond & Danville and Seaboard & Roanoke. This year these companies are constructing over 1,075 miles of road. The Charleston, Cincinnati & Chicago is building over 150 miles, and will complete a good proportion of its line this year. Thus it will be seen that the larger companies are building the longer lines in these sections, and indeed this is true of the entire country.

There are half a dozen lines between which it is difficult to decide which is the most important. They generally extend through country which will give them a lucrative local traffic, which fact may in some cases prove more important than their effect as competing lines. Among those completed this year are the extension of the New York, Ontario & Western to Forest City, Carbondale and Scranton. This parallels the line of the Delaware & Hudson Canal Co., running between it and the New York, Lake Erie & Western. However, the company expects its traffic to come principally from the new anthracite coal mines opened on the lands it has purchased. The tonnage has increased in two weeks from 450 to over 1,000 tons daily, and the company hopes for an annual traffic of 1,000,000 tons.

The extension of the Louisville, Evansville & St. Louis has given it an independent through line between Louisville and East St. Louis. It has heretofore used the track of the Louisville & Nashville west of Mount Vernon, which has been paralleled for some distance. Between the two lines there will be sharp competition.

The two most important lines being built north of the Ohio River are the Lehigh Valley extension to Buffalo, making the sixth trunk line to that city from the east, and the Trenton Cut Off of the Pennsylvania from Downingtown to the Delaware River, opposite Trenton, which will enable through trains between New York and Harrisburg and the west to avoid passing through the crowded yards in the vicinity of Philadelphia. This line parallels one of the divisions of the Philadelphia & Reading. The completion of the Philadelphia & Sea Shore gives the Reading a line across New Jersey from Philadelphia to Cape May, closely paralleling the Pennsylvania. It is also building at Harrisburg a line to connect with the Western Maryland, which is to be extended to the main line of the Baltimore & Ohio, to complete a new route to the West for these roads. The Western Maryland proposes to complete a direct line between Harrisburg and Baltimore.

The extension of the Baltimore & Ohio through Ohio, from Akron west, gives that company a shorter Chicago

line than at present. The Lake Shore has announced its intention of building from Fayette to Chestertown, Ind., if the projectors of the Toledo & Western under take to build that line through Indiana. Both lines would be short routes between Toledo and Chicago.

The Norfolk & Western is doing some rapid construction on its line through West Virginia from the Pocahontas coal fields to the Ohio River. The recent purchase of the Scioto Valley & New England extends this line to Columbus, giving important connections. Other lines of importance in the South are the Georgia, Carolina & Northern from Chester to Atlanta, which the combinations of the Richmond Terminal system have forced the Seaboard & Roanoke to build.

The Georgia Southern & Florida was opened for traffic early in the spring. It is the shortest route to Florida from the Northwest. Extensions of this system to Birmingham and to Savannah from Macon are under contract, and much work has been done on the former line. Legal difficulties over the location, right of way, etc., may delay the work. A new line between Savannah and Columbus and Birmingham was begun last year by the Central of Georgia and Savannah, Americus & Montgomery by the building of a road from Abbeville to Savannah. This has been finished. An extension of the latter system to Montgomery is under contract to be completed by January. The Alabama Midland is an important extension of the Plant System. An extension is being built to Tuscaloosa, which may be continued to Grenada, Miss., on the Illinois Central. The Chattanooga Southern has been completed for many miles between Chattanooga and Gadsden, Ala. The Cincinnati, New Orleans & Texas Pacific already has a line between these points.

The completion of the Knoxville Southern will give an important new line from Atlanta to Knoxville and to Cumberland Gap, connecting near there with the Louisville & Nashville and Norfolk & Western, which are still working on the extensions which are to form a new east and west route from Louisville and further west to points reached by the Norfolk & Western.

The Paducah, Tennessee & Alabama will be practically an extension of the Cairo Short Line through Kentucky and Tennessee to Florence, Ala. The Charleston, Cincinnati & Chicago is building through eastern Tennessee and in North Carolina, and will soon have a continuous line from the seaboard to the Norfolk & Western, reaching valuable mineral properties.

The short lines being built in the South are projected, almost without exception, for local traffic and to develop mineral lands, and many of the longer lines are also being built for this purpose. Some of these latter, however, open up new routes of considerable importance.

West of the Mississippi the Duluth & Winnipeg is laying a mile of track a day on its line to the Lake of the Woods. A road will be built from Winnipeg to connect with it. The Great Falls & Canada is laying track on its road in Montana, which is built to transport coal from Alberta to the interior of the state. The extension of the Rock Island through the Indian Territory will probably not be built any further this year. An important road which this company is building is the line from Omaha to Lincoln and Fairbury, Neb.

Western newspapers are constantly booming the Pacific Short Line, but it can be dismissed with few words. Track is being laid on a graded section of 127 miles in northern Nebraska. A well-known contractor has the contract for the rest of the line to Ogden, but no work has been done, and it is doubtful whether a pass to Ogden from the East can be found. In Wyoming the Burlington & Missouri River is building long lines to South Dakota, entering territory already reached by the Chicago & Northwestern.

Much of the new track laid in Texas in the last few years has been by the San Antonio & Aransas Pass road. And that company is now in the control of receivers.

An expensive work has been done in Utah in changing the gauge of the Rio Grande Western, and the same work is being done on the main line of the Denver & Rio Grande in Colorado. Narrow gauge extensions of these lines are being built in both states.

The Northern Pacific and Oregon & Washington Territory roads are building parallel lines from the line of the former in Washington to the coast at Grays Harbor. The Union Pacific has under contract a line from Portland to Olympia and Tacoma, and is building between the latter points. The Seattle, Lake Shore & Eastern is completing its connection with the Canadian Pacific.

Most of the work in progress in Canada is being done by the Canadian Pacific, or on lines to be operated by that company when finished. The roads are principally west of Winnipeg, but some short lines are being built in Ontario and Quebec.

The Monterey & Mexican Gulf, Inter-oceanic, Mexican Southern and Mexican Pacific Coast are the most important lines engaged in new construction work in Mexico.

Last week there occurred a fatal railroad accident which might have been prevented. At Sibley, Ark., a passenger train was run into on a level crossing by a freight train on another road. Four people were killed and about a dozen injured, some of them severely. Now it is perfectly well known to all railroad men that there is a simple and not very expensive mechanical means of preventing grade crossing collisions with absolute cer-

tainly. That is, by the use of interlocked signals and derailling switches. It may be unreasonable to require all grade crossings to be provided with interlocked signals and deraillers, but any road that feels too poor to provide these safeguards must be prepared to take the risks of money loss and public disapproval. The circumstances of this particular case are still somewhat obscure and we shall not attempt to discuss them here. We merely call attention again for the thousandth time to the real remedy for such accidents.

The staff system for dispatching trains on single track is to be tried in this country, the New York, New Haven & Hartford having made arrangements for its use on the Shore Line division. Numerous fast expresses run over this division, and it would seem necessary to equip the stations with the English device for taking on the staff (or tablet) without stopping the train. As most of our readers know, the use of the staff system in Great Britain is mostly on lines where traffic is not much hurried. The men, however, become very expert at swapping sticks, and the speed of trains does not have to be slackened so often as one would at first thought suppose necessary.

The World's Progress in Railroad Construction.

We copied May 30 part of the trustworthy statistics of the world's railroads, collected periodically for the *Archiv für Eisenbahnwesen*, showing the aggregate length of the railroads of the world at the close of 1888 to have been 355,137 miles, and that no less than 63,912 miles, or 22 per cent., had been added to it in the four years since 1884. The growth was chiefly in America, which added 40,071 miles (27 per cent.) to its lines in the four years, and at the close of it had more than one-half of the railroads of the world, namely 53 per cent., though it has but 28 per cent. of the world's area and 7 per cent. of its population. This, however, is because the two largest continents of the world, Asia and Africa, can hardly be said to have any railroads, the only considerable exceptions being British India, in Asia; Cape Colony and the Mediterranean coast countries in Africa. Asia, with more than one-half the world's population and nearly a third of its land, has less than a fifth of its railroad mileage, and of its total 17,650 miles, 14,509 are in India. Africa has but 5,161 miles in all, about two-fifths of which is in South Africa, and nearly all the rest in Algiers, Tunis and Egypt. Even Australia has twice as much railroad as Africa.

Of the mileage in America at the end of 1888, nearly five-sixths was in the United States, 6½ per cent. in Canada and only one-twelfth was in South and Central America, which together had 15,778 miles, or about one-half more than young Australia, which is not half so large as South America. This country alone had 44 per cent. of the world's mileage and about 13,000 miles more than all Europe.

Europe, however, has by no means ceased to make progress in railroad construction, having in the four years in question increased its mileage by nearly 13 per cent., which is slow growth compared with our 25 per cent. meanwhile, but is doubtless greater in proportion than the growth of other industries. The rate of increase in Canada was greater than here, being 31½ per cent., while still more rapid progress (made from small beginnings) occurred in Brazil (46 per cent.), the Argentine Republic (77 per cent.), and Chili (57 per cent.).

In Europe, France and Germany made the same additions to their mileage, within half a mile, namely 2,514 miles each, followed by Austria-Hungary with 2,272, Russia with 2,263 and Italy with 1,420 miles. The increase in the latter was the most notable in Europe, being nearly 23 per cent. In Great Britain 948 miles were opened meanwhile, an addition of 5 per cent.

The countries where railroad construction affects us most by stimulating the production of articles which compete with our products are the Hungarian half of the Austro-Hungarian Empire, Russia, and British India. Australia and the Argentine Republic also offer a great deal of meat and some grain in European markets. In natural resources Russia probably is capable of offering the most formidable competition; but the character of its population is such that no very rapid progress in production seems likely to occur there. India is making considerable progress in railroad construction, having added 2,820 miles, or 20 per cent, to its mileage in these four years; Russia, 14 per cent., Austria-Hungary, 15; Argentine Republic, 77; Australia, 38. But the increase in all these countries together measured but 13,000, against more than 30,000 in this country.

Australia in its rate of progress and in its proportion of mileage to population resembles the United States more than any other country except Canada. It added 38 per cent. to its mileage in the four years, bringing it up to 10,422 miles, or one mile to about 375 inhabitants, against one in 394 in Canada and (in 1888) one in 423 in this country.

The Chicago Shipyard and Lake Ship Building.

Chicago, or that part of it where 102d street intersects the Calumet River, about a mile from its mouth, lately celebrated the laying of the first keel for an iron or steel ship on the shores of Lake Michigan. This is rather quick work, as the Chicago Shipbuilding Co. was chartered in last November; but the men engaged in this enterprise are many of them from the Globe Iron

Works of Cleveland, the largest shipbuilding yard on the lakes. They propose to have their first two vessels, ore carriers of about 2,500 tons, ready for business at the commencement of next season. The yard is to be devoted exclusively to the construction of steel vessels. When it is in full operation it will give employment to about 1,000 men, increasing the population of Chicago by about 5,000, including women and children; an increment the Chicago people regret was not made before the census.

As an adjunct to the shipyard the Illinois Steel Co. is building a plate mill to roll plates for vessels and other uses, which will be the first steel plate mill west of Cleveland. Until that is completed the company will depend on the Cleveland rolling mill. It is hoped that a good deal of their product will find its way down the new drainage cut, when it is completed, to the Mississippi and to the sea.

The "Soo" canal is increasing its tonnage, 1,377,793 registered tons having passed through it during June; this was 21,115 more than in any previous month. And the tonnage on the Lakes must be increasing very fast, as the last supplement of the "Inland Lloyd's Register" shows a valuation of \$55,128,309, as against a little over \$50,020,000 at the commencement of the year. The size of the boats is also increasing. Thomas Quayle & Sons of Cleveland, are building one with 45 ft. beam, and the Detroit Dry Dock Co. propose building one with 50 ft. beam and 320 ft. on the keel, which will carry 4,000 tons in 14 ft. of water.

The West Superior Iron & Steel Co., which has let the contract for a Bessemer steel plant and machine shop to the Pittsburgh Iron & Steel Engineering Co., hope to have everything in readiness to manufacture ship plates, angles, steel rails, etc., within 12 months, expecting to supply the American Steel Barge Co. with material, and the last named company is moving its shipyard and plant to West Superior.

The Lake shipbuilders, possibly through exceeding prosperity, are assuming airs of decided superiority to their less prosperous brethren on the Atlantic coast, claiming "there is little profit in competing with Eastern builders, as owners of coasting boats are satisfied with mediocre work." The Cramps, Roaches and Harlan & Hollingsworth, who think they put the best work and material into their vessels of any builders in the world, would hardly agree with the assertion. Many of the Lake freighters are undoubtedly very fine boats, however; the "Oswego," for instance, built at Buffalo by Captain Drake, from plans by George B. Mallory, of this city, lately made the run from Buffalo to Chicago, 889 miles, in 54 hours and 15 minutes, or at the rate of 16.4 miles per hour. This is fast time for a boat devoted exclusively to freighting, and it is said that the "Saranac," another freight boat, can compete with her.

TECHNICAL.

Manufacturing and Business.

The American Concave Spring Co. has purchased the patents, shot and tools of the Concave Spring Co., and with ample capital is organized for business. The concave springs have made a good record on several railroads, and many of them are in use under heavy Pullman cars. Mr. William Davidson, who was connected with the former company, is General Manager of the new one. His office is at 15 Cortlandt street, New York and the factory is in Jersey City.

The Lidgerwood Mfg. Co., of New York, has opened a branch house at No. 7 North First street, Portland, Or., in charge of Joseph M. Arthur, where all sizes of hoisting engines will be kept in stock.

The Johnson Railroad Signal Co., of Rahway, N. J., is busy on interlocking work for the Pennsylvania, Illinois, Central, Philadelphia & Reading, Manhattan, New York, Ontario & Western, Prospect Park & Coney Island, and other roads. It is employing about 150 men at present, and may soon enlarge its works.

A certificate of incorporation was filed in New York this week, by the Gibbon Duplex Railway Track Co., of New York City. The capital stock is \$300,000. The company proposes to manufacture rails and materials for railroad construction. John D. Elwell, John Sessions, of Brooklyn, N. Y.; Eustace Conway and Charles E. Ronaldson, of New York City, are the incorporators.

The agency for Texas of the "Bass Contracting Chill," has been secured by the Dickson Car Wheel Co., of Houston, Tex.

The new buildings for the South Tredegar nut and bolt factory, at Chattanooga, Tenn., have been completed and the plant will be in operation shortly.

Articles of incorporation have been filed at Tacoma, Wash., by Lindon W. Bates, H. Prescott and S. J. Maxwell for the Bowers Pacific Dredging Co., with a capital stock of \$100,000. The company is to build wharves, docks, aqueducts and canals.

Creosoting Works to employ 200 men will be built near Houston, Tex., by the Southern Pacific Co.

The Keystone Automatic Life Saving Car Coupling Co. of California, has been formed at San Francisco to manufacture the car coupler invented by C. A. McDougall, of Alameda.

The Norwood Car Replacer Co. has been incorporated at Baltimore, Md., by W. C. Codd, H. C. Thomas and J. E. Norwood, with a capital stock of \$300,000, to manufacture the Norwood car replacer.

The C. H. Dunham Railway Equipment Co., of Chicago, has been incorporated to manufacture railroad supplies and equipments. The capital stock is \$250,000. The incorporators are Irwin Veeder, Otto R. Barnett and P. R. Shumway.

The G. & J. Brown Mfg. Co., of Belleville, Ont., has received an order from the Northern Pacific & Manitoba for two steel turn-tables for Winnipeg.

The Martin Anti-Fire Car Heating Co., of Dunkirk, N. Y., has concluded a contract with the Milwaukee, Lake Shore & Western to fit all its passenger cars with continuous steam heating apparatus the present season.

Iron and Steel.

The Pittsburgh Malleable Iron Co., of Pittsburgh, is constructing a 50 x 120 ft. addition to its works. It will be occupied for the most part by the foundry. The improvements will cost about \$75,000.

The building of the Southern Iron Works at Chattanooga is progressing rapidly. The heating furnaces are in position and ready for use. The open hearth furnaces are nearing completion, and when in operation the company expects them to have in output of 500 tons of finished steel per week.

The St. Louis Iron & Machine Works has the foundation laid for its new 232 x 80 ft. erecting shop. The building will be well equipped with iron working tools and a steam crane to travel the entire length.

The Homestead Steel Works, of Carnegie, Phipps & Co., are to have a Corliss engine with a horizontal cylinder 54 x 72 inches. The fly wheel will weigh 200,000 lbs.; the engine will weigh a little over 500,000 lbs., and it is expected to develop 3,500 H. P.

The Pratt Iron, Coal & Railway Co. has been organized at Birmingham, Ala., with William A. Walker, President and F. D. Nabers Secretary, and has purchased the property of the Mary Pratt Furnace Co., including a coke iron furnace.

Articles of incorporation were filed by the Eastern Steel Co. in New Jersey last week. The objects of the corporation are to manufacture compressed steel castings. The capital stock is \$100,000, with \$1,000 paid in. The incorporators are Soren C. Rockman, Henry C. Terry, George Butler and Matthew D. Johnston, all of Philadelphia, and Lewis C. Starr, of Woodbury, N. J.

The firm of Swindell & Smythe, of Pittsburgh, has been dissolved and Mr. S. R. Smythe, of that firm, has, in connection with the Alexander Laughlin Co., of Cleveland, O., formed a new corporation to be known as the S. R. Smythe & Laughlin Co. The new concern has the following contracts: Complete furnace equipment for Hussey, Binns & Co., Charleroi; two rod mill furnaces and gas producers for Baackes Wire Nail Co., Cleveland, O.; improvement of the furnaces of the Trumbull Iron Co., Warren, O.; also four furnaces, with their improved gas, for Cartwright, McCurdy & Co., Youngstown, O.

The Rail Market.

Steel Rails.—Quotations are: Eastern, \$31@31.50 at mill; Pittsburgh, \$32@33, and Chicago, \$33.50@34.

Old Rails.—Sellers in the eastern market quote \$25; at Pittsburgh, sales have been made at \$27 and at Chicago, \$26.50.

Cooling and Ventilating Cars.

The private car of President Ravelin, of the Northeastern (of South Carolina), recently made a trial trip equipped with a cooling and ventilating apparatus invented by Mr. A. S. Emerson. A number of railroad officers participated in the inspection and expressed themselves as much pleased with the working of the device.

The Ries Electric Traction & Brake Co.

The Ries Electric Traction & Brake Co. has recently been incorporated with a capital stock of \$2,000,000, divided into 20,000 shares of \$100 each. The company has purchased the United States patents granted to Elias E. Ries for methods of and apparatus for increasing traction electrically, and for electric braking, and will carry on a general manufacturing business in connection with the introduction of its electric traction increasing and brake appliances. The incorporators and officers of the company are: John M. Denison, President; John B. McDonald, Vice-President; James Sloan, Jr., Treasurer; Elias E. Ries, Consulting Electrician; Charles Selden, Director; John W. Snyder, Director; and Charles H. Jones, Jr. The principal offices of the company are in the Chamber of Commerce Building, Baltimore. Experimental trials of the apparatus have already been made, and further tests on a more extended scale are now under way at Mount Clare shops.

An Indian Fire Brick Arch.

Mr. C. E. Phipps, the Acting Locomotive Superintendent of the Madras Railway, has recently devised a means of securing economy in fuel expenditure, and his experiments in this direction on three of Sharp Stewart's engines hauling the mail trains during the past few months have been comparatively successful. Mr. Phipps' expedient consists of a small arch of fire bricks of the thickness of three bricks, erected on brass plugs just underneath the last row of tubes of the engine, in the copper fire box of the locomotive, as also the provision of a double damper.—*Indian Engineer*.

The Lorraine Coupler Case.

A decision has been rendered by the U. S. Circuit Court in Missouri, in the case of the Lorraine Car Coupler Co. vs. Madison J. Lorraine and the Keystone Car Coupler Co. The suit was brought to compel the defendants to turn over to the plaintiff letters patent and certain applications for letters patent claimed by the defendants, which were improvements on patents already held by the plaintiff. The Court held that the testimony elicited the fact that Lorraine had agreed to assign to plaintiff all improvements which he might make on the patent rights owned by the plaintiff. Lorraine had received money for the patent rights, and it was held he had to carry out the other features of the agreement and turn over the letters patent.

The Electric Headlight.

The Vandalia line now has 10 of its engines equipped with electric headlights, and will at once equip eight more. These lights, manufactured by the National Electric Headlight Co., of Indianapolis, are now in use on the Wabash, the Cincinnati, Hamilton & Dayton and the Michigan Central, as well as on the Indianapolis, Decatur & Western, where they have been in constant operation for about two years.

The New Croton Aqueduct Opened.

The new Croton Aqueduct was opened July 15. Its full capacity is 318,000,000 gallons a day. Its building has required five years, three years more than as originally projected. The aqueduct has cost to June 30, 1890, \$23,561,973.62.

Pennsylvania Ship Canal.

The Pennsylvania Ship Canal Commission met July 9 in Pittsburgh with all the members present. Mr. John M. Goodwin, who is in charge of surveys, made a report of operations since June 9 to date, covering completion of surveys from Lake Erie to Davis Island Dam; also a reconnaissance from Conneaut Lake to Shaw's Landing, on French Creek; also recommending certain supplemental surveys on French Creek and along the Shenango route. The supplemental surveys were ordered to be carried out at once.

Chignecto Ship Railroad.

Messrs. Rhodes, Curry & Co., of Amherst, N. S., have the contract for building the engine houses on the Ship Railroad, one at the Fort Lawrence and the other at the Tidnish terminus. That on the Bay of Fundy end is well advanced, and some of the machinery is at present being put in position. The engines in these houses will work hydraulic lifts, and the buildings are to cost about \$25,000 each. They are being built of brick, with stone trimmings. The walls are to be 17 ft. high, with a flat roof.

The enlarging and deepening of the dock is still going on, the earth and mud being used for the road bed.

The different sub-contractors along the line are pushing the work. At a meeting of the contractors held in England lately, it was decided to have the work completed by the first of July, 1892.

James Harris & Co., of St. John, N. B., have taken a contract to supply the ship railroad with 600 car wheels to support the cradles on which the ships ride. These wheels will weigh 1,400 pounds each, and the whole job is worth about \$15,000.

Rapide Plat Canal.

The specifications for the three sections of the Rapide Plat division of the Williamsburg (Canada) canals have been issued to contractors. On section 1 the lock is to be built, the gates hung and in working order, and the dredging and other works connected with the deepening and widening of the canal on this section by Nov. 1, 1892, and the supply, weir walls, etc., by April 1, 1893. On sections 2 and 3 the works connected with the deepening and widening of the canal must be completed by Nov. 1, 1891, and the whole of the works embraced in the two contracts by April 20, 1892.

THE SCRAP HEAP.**Notes.**

Near Forsyth, Ga., recently 21 telegraph poles were shattered by a single stroke of lightning.

A Denver paper states that the Gunnison Division of the Union Pacific is still blocked in the deep cañons by large blocks of ice, resulting from snow which lodged in dense masses and was subsequently frozen.

The Louisiana Legislature has passed, and the Governor has signed, the "special car bill," similar to that of Mississippi, requiring all railroad companies to furnish equal but separate accommodations for white and colored passengers.

The telegraph operators of the Baltimore & Ohio Southwestern have presented a petition for an increase in salaries. Operators who are now getting \$40 per month ask for \$1.00 per day, and those receiving \$50 per month ask for \$2 per day.

General Manager Smith of the Denver & Rio Grande has issued an order abolishing the custom of conductors giving receipts for cash fares. The Rio Grande conductors are a fine lot of men and are worthy the confidence of the officials.—*Exchange*.

One span of a bridge of the Memphis & Charleston over the Flint River near Huntsville, Ala., was burned July 8. A bridge of the Somerset Railroad at North Anson, Me., was thrown out of place by high winds on the night of July 8 and the road made impassable.

The Cincinnati, Hamilton & Dayton has just pulled down the old roundhouse at Cincinnati which was built about 1854. The building was 175 ft. in diameter and the dome-shaped roof was 110 ft. high. The lower ends of the roof trusses were pulled out one by one by locomotives until the whole roof fell bodily.

Eighteen warrants have been issued at Utica, N. Y., for the arrest of locomotive runners of the New York Central and the West Shore roads for running through the city at a rate of speed higher than that prescribed by the municipal ordinance, which limits the rate in or across any street to eight miles an hour.

A party of railroad men were recently sitting together at the Denison House when a general manager remarked that it had been nine years since a passenger had been killed on his line. This drew from Wm. R. McKeen, President of the Terre Haute & Indianapolis, the remark that it was 38 years since a passenger had been killed on the T. H. & I.—*Indianapolis Journal*.

According to the latest time-tables, there is an acceleration of speed on both the East and West Coast lines, from London to Edinburgh. This acceleration, however, is not as great as that reached in the "race to Edinburgh" in August, 1888. At that time the inclusive speed by regular schedule was 50 1/2 miles per hour on the East Coast, and 50 miles per hour on the West Coast route, which is 7 1/2 miles longer. The best inclusive time now made is 47 miles per hour on the West Coast and 46 per hour by the East Coast. *Engineering* thinks that the increase of speed just made is the beginning of another race.

The various roads entering Chicago have subscribed the undermentioned amounts to the stock of the proposed World's Fair to be held in that city. All of the subscriptions, except those of the Alton and the Wabash, are for the sums allotted to the several roads by a committee of general managers, which made out a schedule aggregating \$815,000 several months ago. The Alton was allotted \$50,000, and the Wabash \$30,000. It is expected that these roads will subscribe the additional amounts indicated, and that the four roads not mentioned here will soon fill out the list.

Roads.	
Chicago, B. & Q.	\$50,000
Chicago, Mil. & St. P.	50,000
Chicago, R. I. & P.	50,000
C., S. F. & C. and A., T. & S. F.	50,000
Chicago & Alton	30,000
Chicago & Northwest	50,000
Illinois Central	50,000
Lake Shore & M. S.	50,000
Michigan Central	50,000
Pitts., Ft. W. & C.	50,000
Wis., C. & No. Pac.	50,000
Baltimore & Ohio	30,000
Chicago & G. T. and G. T.	30,000
Wabash	30,000
Chicago, St. L. & Pitts.	20,000
Louis., N. A. & C.	20,000
Chicago & Eastern Ill.	15,000
Total	\$665,000

The Fort Worth & Rio Grande has just received an exhibition car from the shops of the Illinois Central, where it was built. The car is 60 ft. long, and on the outside has maps of Texas showing the entire railroad system of the state with a design entitled "Let us have Peace" above soldiers in blue and gray. In the inside are receptacles containing 30 kinds of fruits, 15 kinds of cereals, all kinds of grasses and specimens of

every kind of ore found in the state. The car will be taken to Boston for exhibition at the G. A. R. encampment there during August. From there the car will be taken to various points east and west.

The Cost of Unnecessary Trains.

Some figures concerning the costly luxury of operating unnecessary railroads and running unnecessary trains have been published at Chicago by Mr. S. Y. McNair, Auditor of the Interstate Commerce Railway Association. The general facts are familiar enough to railroad men, but it is worth while to occasionally glance at the figures, even if they be only estimates. Mr. McNair is evidently engaged in the laudable endeavor to educate the public in matters concerning which they need enlightenment. He says: "The four roads contending for the passenger traffic between Chicago and Omaha run 22 trains daily, and four trains six times a week, one way, and convey an average of about 200 passengers of all classes one way." He estimates that one train each way on each road would handle the whole business, saving \$2,540,876 a year in train expenses. If the number of trains were doubled, in order better to accommodate local traffic, still \$1,364,210 would be saved, a large share of which might be divided with the public in the way of cheaper fares. Mr. McNair believes the total waste in this useless competition throughout the United States will reach \$200,000,000 annually, almost all of which could be saved by a legalized division of traffic.

Station Platform Signals.

The Baltimore & Ohio has just put in use at Baltimore a set of signals similar to those used in Broad Street Station, Philadelphia. On top of the railing through which the passengers go from the waiting room to the cars and at the head of the six tracks are six semaphore arms and lanterns that show either a red or white light. One minute before train time an operator signals to the ticket agent, who stops selling and notifies those at the window that they "had better move lively." Ten seconds before the train starts the operator signals the gateman that time is almost up. When train time arrives the gateman receives another signal from the operator and promptly shuts the gate and drops the arm, or at night changes the light from red to white. As soon as the train conductor sees the signal he pulls the bell rope.

Railroad Matters in Colleges.

The *Annual Register* of Trinity College, N. C., contains a synopsis of a course of instruction in "Transportation in the United States." The course does not embrace construction or operation of railroads, but deals with their statistics and their relations to each other, to individuals and to the state. Naturally such a course must embrace questions of consolidation, competition and pooling; of government and state control; and of railroad finance and accounts. It is a wonder that similar courses of instruction are not more common in the colleges of the country. They might keep our lawmakers from many terrible mistakes.

Taxes on Sleeping Cars.

The Supreme Court of Georgia on July 7 rendered a decision in the sleeping-car tax cases, affirming the decision of the Superior Court in granting an injunction restraining the Controller General from collecting this tax for this year. The Supreme Court holds that the Judge of the Superior Court was right in restraining the collection of the tax for 1889, holding that, whether the tax be valid or invalid, it was not collectible by execution, in whole or in part, before the 1st of October next after the passage of the act.

Terminal Improvements at St. Paul.

The Chicago, St. Paul, Minneapolis & Omaha and the Chicago, Milwaukee & St. Paul have begun extensive improvements along the east levee of the Mississippi near St. Paul. Heavy retaining walls are to be built along the base of the bluff. A large freight depot is to be erected just east of the Robert street bridge for the Omaha road, and the space covered by the old Sioux City depot is to be cleared for tracks. The grading is to be carried further out and the track room widened.

Electric Train Lighting in India.

The proposal to light the mail train between Calcutta and Umballa with the electric light, which was dropped some time ago, has again been under the consideration of the railroad authorities, and its adoption is now merely a matter of time. The chief point remaining to be settled is whether the light shall be supplied from storage batteries in the carriages or by a dynamo worked from the engine. Experiments will probably be made in the first instance on the old East Indian loop line.—*Indian Engineer*.

Running from a Tornado.

On July 13 a tornado struck three miles north of St. Paul, causing a loss of life and considerable devastation in the region of the lakes thronged by Sunday excursionists. The passengers on a St. Paul & Duluth train were approaching Gladstone, Minn., when they observed the tornado forming and watched its whirling motion with interest rather than fear or excitement. The engineer, however, saw the threatening aspect of the sky, and pulled the throttle wide open. His judgment and quick action undoubtedly saved many people on his train, for the whirlwind crossed the track scarcely more than a minute after the train had passed.

Trans-Caucasian Railroad.

The project for the railroad between Vladikavkas and Tiflis is at present under revision by a committee. It is understood that the proposed line will necessitate the tunneling for some four and a half versts through the principal chain of the Caucasus range, the great pass of Dargala, along which the present highway runs, being thus altogether avoided.

A second line of rails will shortly be laid on the Trans-caucasian Railroad.

A Canadian Ship Railroad.

A ship railroad is proposed between Georgian Bay and Toronto, 60 miles long, which will shorten the route between Chicago and Toronto some 600 miles. Mr. Thomas C. Keefer is mentioned in connection with the project, as are also Messrs. Kivas Tully and Joseph Blakely. Mr. E. C. Corthell has been consulted and speaks favorably of the project.

A New York and Philadelphia Ship Canal.

Prof. L. M. Haupt has recently published plans of a ship canal between New York and Philadelphia. The proposed route from Bordentown, making use of the Delaware & Raritan Canal for a portion of the distance, to the Raritan River near New Brunswick, is 33.74 miles long. The proposed dimensions of the cross section are

90 ft. at bottom, depth 20 ft. and side slopes of two-thirds. Six locks are proposed 500 ft. long, 60 ft. wide and 20 ft. deep, with a lift of 25 ft. The estimated cost is \$12,552,901.

Siberian Railroads.

A dispatch from Vladivostok announces the arrival there of two Chinese officials and two British engineers, who have made a preliminary survey of the construction of a railway through Mongolia. Reuter says they declared that the Chinese Government desired to expedite the settlement of the question of constructing a railway to the Russian frontier.

Going Astray at an Early Age.

There is nothing in the world so like a Texas steer as a freight car when it (the freight car) takes a notion to go on a rampage. Recently the Mexican International bought a lot of freight cars in Chicago to be sent to Mexico; permission was given to load these cars on their way down. Two of them went astray, and after two months' hunting they were found at the other end of the continent. They had been released at St. Louis and sent to Bangor, Me. There is no counting on a box car when it gets loose.—*Western Rambler*.

A Michaelis Fund.

A movement has been started to raise a fund for the benefit of the family of Major Michaelis, whose untimely death was mentioned a few weeks ago. Major Michaelis left a wife and six children, and, like most army officers, had been able to accumulate little. His widow has taken steps toward supporting her family herself, but some of the friends of Major Michaelis wish to raise a small fund, to be invested in a house or in some other manner for her. They take this step entirely without the knowledge of Mrs. Michaelis. The committee who have the matter in charge are Messrs. Shinn, Becker, Brush, Collingwood and Bogart, of the American Society of Civil Engineers; Martin, Post, Wheeler and Phelps, of the American Institute of Electrical Engineers. Contributions may be sent to any of these gentlemen.

LOCOMOTIVE BUILDING.

The Kingston Locomotive Works Co. has sold five locomotives to the Canadian Pacific, one to the Quebec & Central, and one to the Northern Pacific & Manitoba. The company has numerous other orders on hand.

The Louisville, New Albany & Chicago road has this week received four heavy freight engines from the Baldwin Locomotive Works, and in next month will receive six others.

The Norfolk & Western has just added three new postal cars to its rolling stock.

The Peoria & Pekin Union road has recently placed a contract for two mogul engines.

The Baltimore & Ohio will probably build 10 additional 10-wheel passenger locomotives similar to those built by the Baldwin Works for hauling trains over the mountain grades. The engines have cylinders 21 x 24, driving wheels 66 in. in diameter, and a boiler pressure of 160 lbs.

CAR BUILDING.

Contracts have recently been let by the Atchison, Topeka & Santa Fe to the Wells & French Co. for 1,000 box and furniture cars, and to the St. Charles Car Co. for 400 other freight cars.

The Jackson & Sharp Co., of Wilmington, Del., has completed for the Lehigh Valley three passenger and three combination cars. The company is also building six passenger cars for the Richmond & Danville and two for the Cincinnati, Wabash & Michigan.

The St. Charles Car Co. has completed a private car for the president of the Mexican Central. There are six compartments. The car weighs 89,000 lbs.

The Robinson & Moan car works near Minneapolis have been sold to C. P. Jones, of Minneapolis, and C. E. Mabie, of Sioux Falls. The new company will enlarge the works, probably doubling the present capacity. The firm builds street cars only.

Carter Bros., of Newark, Cal., are building 100 four-wheel cars for the Pajaro Valley road. They expect to have the order completed in 40 days.

A company has been organized to build car works at Montgomery, Ala. It is stated that it has secured 15 acres of land in that city and that some of the machinery has been ordered. Work on the foundations for the buildings will not be commenced until about Sept. 1. The company has a capital stock of \$200,000. The officers are: President, Charles Webster of Phillips, Wis.; General Manager, Captain Burr of Stephens' Point, Wis., and General Superintendent, Edward Gilbert of Oshkosh, Wis.

BRIDGE BUILDING.

Brownsville, Tex.—The Continental Bridge Co. has been chartered in Texas to build a railroad and wagon bridge across the Rio Grande River, from near Brownsville to Matamoros, Mexico. The capital stock is \$1,000,000. The officers of the company are: Felician San Roman, of Brownsville, President; Enrique Viscaya, of Mier, Mexico, Vice-President; James A. Brown, Secretary; G. H. Torney, of Brownsville, Treasurer.

Burlington, Ia.—The Chicago, Burlington & Quincy has completed plans for the erection of a double-track railroad bridge over the Mississippi River at Burlington to replace the present structure. The new structure will be built on the site of the old one, without interfering with railroad traffic.

Chicago.—The Kenwood Bridge Co., of Chicago, has been incorporated to manufacture iron and steel bridges. The capital is \$100,000. The incorporators are: F. W. Baker, Paul Willis and G. W. Murray.

Columbus, Ga.—Work will soon be commenced on the new iron bridge which is to be erected over the Chattahoochee River at Columbus by the Central of Georgia to replace the present wooden structure of the Mobile & Girard. The cost is estimated at \$50,000, including masonry.

Duluth, Minn.—The letting of the contracts for the foundations and masonry for the drawbridge over Minnesota Point Canal at Duluth has been postponed on account of some legal matters.

Lexington, Miss.—The County Court has let the con-

tract for the bridge over Tehula Lake to the Chicago Bridge Co., at \$15,000.

Llano, Tex.—The Llano River will probably be bridged at this point by an iron structure, to be erected by the city.

New Iberia, La.—An iron bridge is to be erected across the Teche River at New Iberia to replace the present wooden structure.

New York City.—Five bids were received by the Department of Public Works for the 1,000-ft. viaduct at 155th street and Seventh avenue. The bids were as follows, the contract being awarded to Herbert Steward, who has assigned it to the Union Bridge Co., of New York: Herbert Steward, \$514,423; M. S. Coleman, \$584,123; Mahoney Bros., \$520,661; J. J. Hoppin, \$518,199; Keystone Bridge Co., \$508,361.

The Secretary of War has notified the city authorities that the Third avenue bridge across the Harlem River at One Hundred and Twenty-seventh street must be replaced, or the structure heightened and the spans lengthened.

Paterson, N. J.—Proposals will be received at Paterson, N. J., until July 23, for building two low-truss wrought-iron bridges across the Passaic River; one on East Twenty-third street, and the second on Fifth avenue. The bridges are to be built by Passaic and Bergen counties, jointly.

Peoria, Ill.—A contract has been awarded by the Peoria & Pekin Union road for a new iron bridge across the Peoria River at Peoria. The structure will probably cost \$50,000.

Roanoke, Va.—Bids for constructing approaches to overhead bridges over the Norfolk & Western and Shenandoah Valley roads at Randolph, Henry and Park streets, Roanoke, will be received until Aug. 4 by James A. McConnell, Roanoke.

St. Louis.—The Board of Public Improvements has recommended to the Assembly ordinances providing for the following improvements in Forest Park; Bridge No. 8, to cost \$5,000 and a \$1,000 foot bridge across the River des Peres.

Wheeling, W. Va.—The committee of the city council has extended the time for receiving bids for the proposed 158-ft. span stone arch bridge over Wheeling Creek from July 21 to July 28.

RAILROAD LAW—NOTES OF DECISIONS.

In Louisiana the Supreme Court holds that two railroad companies which have each a through and separate line of communication between two given points are competing companies for all traffic between such points. An arrangement by which two competing systems of railroads agree to divide their earnings for traffic between given points, for which they were previously competitors, is against public interest, contrary to public policy, and cannot be judicially enforced. Courts will not decree the nullity of a contract against public policy sought to be enforced, but will abstain from dealing with it, or adjudicating any rights arising thereunder, or giving their aid for the division of results, although ascertained, between the parties thereto.¹

In Florida the Supreme Court decided that where a railroad company fails to comply with the provisions of Act of 1875, granting the right of way to railroads through the public lands of the United States the company has no right to run its road through the land of a homesteader who had complied with the terms of the homestead law, although the homesteader had not at the time received his patent from the government.²

Carriage of Goods and Injuries to Property.

In Arkansas the Supreme Court rules that where a railroad company permits cotton seed to accumulate on or about its track, it is under obligation to maintain reasonable care to prevent injury to stock attracted thereby. Where stock is killed by a train while eating such seed, scattered near the track, the burden is upon the railroad company to overcome the *prima facie* case of negligence made by the killing, by showing that its servants had used reasonable care to avert the injury.³

In North Carolina the Supreme Court holds that the section of the Code providing that the killing, etc., of cattle "by the engines or cars running upon any railroad shall be *prima facie* evidence of negligence on the part of the company," applies where the cattle are yoked to a cart, and in charge of a driver, as well as where they are running at large.⁴

In New York a railroad erected a shanty of pine boards close to plaintiff's building, the intervening space being insufficient to allow a person to pass through. The shanty contained a small iron stove, in which was burned soft coal, and oil cans, waste and oil lamps were kept in the shanty. The shanty caught fire and burned, the flames being communicated to plaintiff's premises, which were damaged. There was no direct evidence as to the origin of the fire. The Supreme Court holds that the burning shanty was the direct and proximate cause of the damage to plaintiff's premises, and that the railroad is liable.⁵

In Kansas, the Atchison Town Co. platted a tract of land lying on the west bank of the Missouri River for a town site, indicating on the plat that there was a street along the river, but failing to show the width of the street or to indicate by figures the dimensions of the lots and blocks fronting thereon. Subsequently, under authority of the Legislature, a highway of a specified width was established along the river, within the limits of the city, and thereafter the city authorized a railroad company to construct and maintain a railroad upon the highway so established, which was done. The ground occupied by the company does not extend beyond the limits of the highway, and the occupancy of the highway by the railroad company has continued from that time until the present. An owner of a lot fronting on the street claimed that, according to the plat and dedication, the railroad company was occupying a portion of his lot, and brought an action to eject it therefrom. The Supreme Court decides that, as the railroad was constructed upon a highway or street of the city established as aforesaid, and was laid thereon by authority of the city, the action of ejectment cannot be maintained.⁶

In New York in an action against a railroad for killing plaintiff's horses, the evidence was that the engineer blew the locomotive whistle near a street crossing in the city to warn the agent at the next station and people at the next street crossing of the approach of the train, at which plaintiff's horses became frightened, and ran on the track and were killed. The Supreme Court holds that the court properly charged that defendant had a right to sound the whistle to give warning of the approach of the train, but that it was for the jury to say

whether defendant had abused that right by sounding the whistle at a time and place, in a manner, and under circumstances not necessary for the proper conduct of its business, and, if so, whether such negligence was the cause of the injury.⁷

Injuries to Passengers, Employees and Strangers.

In Maryland the Court of Appeals holds that a postal clerk of the railroad mail service, holding a photographic commission entitling him to ride as a passenger on a railroad train while on duty and in returning home, who, with the conductor's permission, rides, while off duty, on his way home, in the postal car, is not *per se* guilty of contributory negligence so as to defeat an action for his death, caused by a collision, though the postal car was subject to greater risks than the cars intended for passengers, and if he had remained in the smoking car, in which he commenced the journey, he would probably have escaped injury.⁸

In Louisiana the Supreme Court rules that where plaintiff voluntarily jumped from a moving train uninfluenced by any invitation expressed or intended by the company's employees, and excused by no impending danger, except his unwillingness to be carried beyond his destination, his action for resulting injury is barred by his own contributory negligence.⁹

In Nebraska the Supreme Court held that a sleeping-car company, so far as it renders service similar in kind to an innkeeper, is subject to the same liabilities, and where an article of wearing apparel belonging to a passenger in a sleeping-car has been placed in the care of the porter, and is stolen from the car, the company will be liable therefor.¹⁰

In Alabama the Supreme Court holds that the engineer of a train, not being bound to anticipate trespassers on the track, is under no duty to keep a vigilant lookout for them, in the absence of special reason for diligence in this particular.¹¹

In Kentucky a train was coming towards a small town, the houses of which were on either side of the track, and while some distance from the depot part of the train was detached, the engine and some of the cars running on ahead and passing the depot, while the detached portion was allowed to come on slowly down the grade, with no lights in front, no bell or other signal to announce its approach, and no one to look out for persons on the track. The night was dark, and plaintiff's intestate, after having seen the engine with cars attached to it pass by, started across the track, though not at a public crossing, and was run over by the rear portion and killed. The Court of Appeals held that the detaching part of the train, and allowing it to run into the town in such a manner, was such a departure from defendant's duty to the public as to entitle plaintiff to recover, though his intestate was a technical trespasser.¹²

In Kansas the Supreme Court rules that where a person with a team crossing a railroad on the highway of a village is injured by an engine, running rapidly backward at the rate of 30 miles an hour, without any signal given, and such person has looked up and down the track and fails to discover the engine, and there is a heavy snow falling, the question of negligence is for the jury.¹³

In Pennsylvania the plaintiff was injured at a crossing early in the morning, while it was quite dark, by being run over by a backing train consisting of a dozen cars. The crossing was one regularly used by the employees of an adjacent mill, where plaintiff was employed. The train was backed without warning, no brakeman was on the end of the train, nor were any lights displayed. There had been a slight fall of snow which deadened the sounds. The evidence showed that the view on either side of the track at the crossing was obstructed by pig metal piled there by defendant. Plaintiff testified that, immediately before attempting to cross, he stopped, looked and listened, and saw and heard nothing. The trial court held the railroad not liable, but the Supreme Court on appeal reverses that decision.¹⁴

- ¹ Tex. & Pac. R. Co. v. South Pac. R. Co., 6 South Rep., 888.
- ² S. F. & W. R. Co. v. Davis, 7 South. Rep., 29.
- ³ L. R. & F. S. R. Co. v. Dick, 12 S. W. Rep., 788.
- ⁴ Randall v. R. & D. R. Co., 10 S. E. Rep., 601.
- ⁵ Van Fleet v. N. Y. C. & H. R., 7 N. Y. (Supp.), 636.
- ⁶ A. & N. R. Co. v. Manley, 22 Pac. Rep., 567.
- ⁷ Mayer v. N. Y. C. & H. R., 8 N. Y. Supp., 461.
- ⁸ B. & O. R. Co. v. State, 18 Atl. Rep., 1,107.
- ⁹ Walker v. V. S. & P. R. Co., 6 South. Rep., 916.
- ¹⁰ P. P. Car Co. v. Lowe, 44 N. W. Rep., 226.
- ¹¹ Carrington v. L. & N. R. Co., 6 South Rep., 919.
- ¹² Conley v. C. N. O. & T. P. R. Co., 12 S. W. Rep., 764.
- ¹³ A. T. & S. F. R. Co. v. Morgan, 22 Pac. Rep., 995.
- ¹⁴ Fisher v. M. C. R. Co., 18 Atl. Rep., 1,016.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Huntingdon & Broad Top Mountain, \$1.50 per share, payable July 21.

Lake Erie & Western, quarterly, 1 per cent.

Mine Hill & Schuylkill Haven, \$2.00 per share, payable July 15.

Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Anniston & Cincinnati, special, Anniston, Ala., July 28, to act upon a proposed consolidation with the Anniston & Atlantic.

Anniston & Montgomery, special, Anniston, Ala., Aug. 2.

Boston, Hoosac Tunnel & Western, annual, Grand Union Hotel, Saratoga Springs, N. Y., Aug. 20.

Indianapolis, Decatur & Western, special, Indianapolis, Ind., July 22.

Kentucky Union, annual, Louisville, Ky., July 21.

St. Louis & San Francisco, special, St. Louis, July 21, to vote on the proposition of an increase of the common stock of the company.

Troy, Saratoga & Northern, annual, Grand Union Hotel, Saratoga Springs, N. Y., Aug. 20.

Railroad and Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *Traveling Passenger Agents' Association* will hold its next annual convention at Buffalo, N. Y., August 19.

The *New England Roadmasters' Association* will hold its eighth annual meeting at Boston, Mass., Aug. 20 and 21.

The *National Association of General Passenger & Ticket Agents* will hold its next semi-annual meeting at Denver, Col., Sept. 17.

The *American Society of Railroad Superintendents* will

hold its annual meeting in New York City on the day preceding the fall meeting of the General Time Convention.

The *New England Railroad Club* meets at its rooms in the United States Hotel, Beach street, Boston, on the second Wednesday of each month, except June, July and August.

The *Western Railway Club* holds regular meetings on the third Tuesday in each month, except June, July and August, at its rooms in the Phenix Building, Jackson street, Chicago, at 2 p. m. The Club has adjourned until Tuesday, Sept. 16.

The *New York Railroad Club* meets at its rooms, 113 Liberty street, New York City, at 7:30 p. m., on the third Thursday in each month.

The *Central Railway Club* meets at the Tift House, Buffalo, the fourth Wednesday of January, March, May, August and October.

The *Northwest Railroad Club* meets on the first Saturday of each month in the St. Paul Union Station at 7:30 p. m.

The *Northwestern Track and Bridge Association* meets on the Saturday following the second Wednesday of each month at 7:30 p. m. in the director's room of the St. Paul Union station, except in the months of July and August.

The *American Society of Civil Engineers* holds its regular meetings on the first and third Wednesday in each month at the House of the Society, 127 East Twenty-third street, New York.

The *Boston Society of Civil Engineers* holds its regular meetings at the American House, Boston, at 7:30 p. m. on the third Wednesday in each month. The next meeting will be held the third Wednesday in September.

The *Western Society of Engineers* holds its regular meetings at its hall, No. 67 Washington street, Chicago, at 7:30 p. m., on the first Tuesday in each month.

The *Engineers' Club of St. Louis* holds regular meetings in the club's room, Laclede Building, corner Fourth and Olive streets, St. Louis, on the first and third Wednesdays in each month.

The *Engineers' Club of Philadelphia* holds regular meetings at the House of the Club, 1,122 Girard street, Philadelphia.

The *Engineers' Society of Western Pennsylvania* holds regular meetings on the third Tuesday in each month, at 7:30 p. m., at its rooms in the Penn Building, Pittsburgh, Pa.

The *Engineers' Club of Cincinnati* holds its regular meetings at 8 p. m. on the third Thursday of each month at the Club rooms, No. 24 West Fourth street, Cincinnati.

The *Civil Engineers' Club of Cleveland* holds regular meetings on the second Tuesday of each month, at 8:00 p. m., in the Case Library Building, Cleveland. Semi-monthly meetings are held on the fourth Tuesday of the month.

The *Engineers' Club of Kansas City* meets in Room 200, Baird Building, Kansas City, Mo., on the second Monday in each month.

The *Engineering Association of the Southwest* holds regular meetings on the second Thursday evening of each month at 8 o'clock, at the Association headquarters, Nos. 63 and 64 Baxter Court, Nashville, Tenn.

The *Civil Engineers' Society of St. Paul* meets at St. Paul, Minn., on the first Monday in each month.

The *Montana Society of Civil Engineers* meets at Helena, Mont., at 7:30 p. m., on the third Saturday in each month.

The *Civil Engineers' Club of Kansas* holds regular meetings on the first Wednesday in each month at Wichita, Kan.

Accounting Officers.

At the convention of the Association of American Railway Accounting Officers, at Cape May, N. J., July 10, Mr. Max Riebenack, Assistant Comptroller of the Pennsylvania, was unanimously re-elected President of the association; Mr. Cushman Quarrier, Comptroller of the Louisville & Nashville, was elected First Vice-President, and Mr. D. A. Waterman, Auditor of the Michigan Central, Second Vice-President.

Civil Engineers' Club of Cleveland.

A regular meeting was held July 8, 1890. President Seales in the chair. Present 18 members and three visitors.

Mr. James Morris Wright was elected to active membership.

Mr. Mordecai reported for the Committee on Affiliation that he had heard from Mr. Holloway, who had attended the meeting appointed in New York for conference, and that the attendance was very small, and nothing was accomplished at that time.

The President read a letter from Mr. C. Kirchhoff, Jr., Secretary of the American Reception Committee, stating that, owing to a change in the programme, the party of Foreign Iron Masters and Engineers will not visit Cleveland; however, some individual members may be able to do so.

The amendments to the constitution of the Association of Engineering Societies, proposed by the Board of Managers and published in the December number of the Journal, were presented for consideration. On motion of Mr. Barber, seconded by Mr. Gobeille, the first and second amendments were separately discussed, and finally adopted.

The paper of the evening on "Methods of Wall Decoration" was read by Mr. C. O. Arey. After noting the objections to oil colors and kalsomining process, he narrated his experience with other methods. The encaustic process as practiced by the ancient Greeks was found too expensive. The fresco practiced by the early Renaissance was found satisfactory with the exception that the work was liable to be injured or broken after completion by the finishing carpenters. He then tried many experiments to find a method similar to the fresco which could be applied on a dried wall; this was accomplished by a chemical union of alum and lime, providing only mineral colors were used. This method allows one to apply on the wall a permanent finish unaffected by water at a very moderate expense. The paper was discussed by Messrs. Barber, Hermann, Richardson, Porter and others.

After adjournment many members of the club visited the fallen electric-light mast, which was wrecked by the storm a few hours previous.

Independent Order of Railway Conductors.

The conductors in the Eastern and Middle states who have seceded from the "Order of Railway Conductors" formed a permanent organization at New York City July 13, under the above name. It is said to have a membership of 300, with five divisions. The only material difference between the constitution of the new organization and that of the old is on the points of the strike clause and the insurance. In the old organization the insurance is a separate feature, and its membership form

a separate order, which pays \$2,500 upon death or total disability. In the new each member is entitled to \$1,000, for which an assessment of \$1 is to be levied on each member. The following officers were elected: President, C. S. Wheaton; vice-President and Secretary, E. D. Nash; Executive Committee, F. J. Griffith; Chairman, M. Severance and S. D. Chittenden. The next meeting will be held on the first Tuesday in June, 1891, at St. Albans, Vt.

PERSONAL.

—Mr. A. A. McLeod, President of the Philadelphia & Reading, has resigned the office of General Manager of the Elmira, Cortland & Northern.

—Mr. E. W. Kinsley has been appointed Railroad Commissioner of Massachusetts for another three years, this being the third time he has received this appointment.

—Mr. Murray Harris, formerly of the Texas & Pacific and Missouri, Kansas & Texas, has been appointed Chief Engineer of the Pecos Valley road, to succeed Mr. H. H. Cloud, resigned.

—Col. W. J. Ross, formerly connected with the Memphis & Charleston, died last week at Memphis of paralysis, from which he had been a sufferer for a number of years. His remains were taken to Tusculum, Ala., for interment.

—Mr. W. C. Durand and Mr. W. M. Murphy, of Chattanooga, have formed a partnership, as railroad contractors, under the firm name of Durand & Murphy. They will carry on the business heretofore conducted by Mr. W. C. Durand.

—Ex-Mayor David A. Bunton, died at his home in Manchester, N. H., last week, aged 84 years. He was at one time Superintendent of the Manchester & Lawrence road, and had been connected with local banking institutions for many years.

—Mr. W. W. Sylvester, late Chief Clerk in the office of the Superintendent of the Savannah, Florida & Western, has taken a position in the office of the Assistant General Passenger Agent of the New York, Lake Erie & Western, in New York City.

—Mr. José R. Villalon has been appointed Resident Engineer of the Spanish-American Iron Co. He sails for Santiago de Cuba July 17, when he will begin surveys for the construction of a line of railroad from the iron ore mines to the Daiquiri Bay, and for the improvement of this harbor to make it a shipping point for ore.

ELECTIONS AND APPOINTMENTS.

Alabama Midland.—The stockholders of the company this week elected the following board of directors: W. S. Chisholm, M. T. Plant, M. J. O'Brien and H. M. Flagler, New York; H. S. Haines, Savannah; O. C. Wiley, Joel D. Murfree, W. F. Vandiver and J. W. Woolfolk, Alabama. The directors elected the following officers: W. S. Chisholm, of New York, President; J. W. Woolfolk, of Alabama, Vice-President; J. Moultrie Lee, of Savannah, Treasurer; R. B. Smith, of New York, Secretary. The following is the executive committee: W. S. Chisholm, Col. H. S. Haines, M. F. Plant, H. M. Flagler and M. J. O'Brien.

Albany, Florida & Northern.—The officers of this Georgia company are: Nelson Tift, President, Albany, Ga.; S. H. Hawkins, Vice-President, Americus, Ga.; W. E. Mitchell, Secretary and Treasurer, Albany, and W. W. Campbell, Chief Engineer, Americus. The officers of the Albany Investment & Construction Co., which is building the line, are as follows: S. R. Weston, President, and T. N. Woolfolk, Secretary and Treasurer, both of Albany, Ga.

Albert Southern.—At a meeting of the stockholders of this road held in Hillsboro, N. B., last week, J. M. Steeves, A. E. Killam, Bliss Steeves, G. S. Turner, D. C. Cleveland, W. A. Trueman and J. A. Beatty were elected directors. At a meeting of directors J. M. Steeves was chosen President, A. E. Killam Managing Director, and W. A. Trueman Secretary-Treasurer.

Atlantic Coast Line.—H. M. Emerson has been appointed Assistant General Freight and Passenger Agent of the line.

Autaugaaville & Northern.—The officers are: M. M. Smith, President; J. W. Hicks, Vice-President; M. Howard, Secretary; Col. T. L. Faulkner, Treasurer; F. C. Faust, Civil Engineer, of Autaugaaville, Ala.

Boston & Maine.—H. N. Rowell has been appointed Superintendent of Telegraph of all the divisions of the road.

Bristol, Elizabethton & North Carolina.—William McGeorge, Jr., President, Philadelphia; J. H. Caldwell, Vice-President, Bristol, Tenn.; J. H. Dinger, Treasurer, Philadelphia; J. Cox, Jr., Secretary, Philadelphia, and G. S. Bruce, Chief Engineer, Bristol.

Charleston, Kentucky & Western.—J. S. Spaulding of York, Col. R. M. Nelson of Newport, Ky.; Maj. Bullock of Falmouth, Ky.; Dr. M. Dills of Carlisle, James M. Bigstaff, Adam Baum and W. H. Trimble of Mt. Sterling, Ky., are the projectors of this road.

Chattanooga, Rome & Columbus.—William H. Price has been appointed Purchasing Agent, with office at No. 9 Pine street, New York, vice G. W. Ettenger.

Chesapeake & Ohio.—J. D. Hoban has been appointed Assistant Superintendent of the Huntington Division, with headquarters at Clifton Forge, Va.

Chicago & Alton.—W. H. Abel has been appointed Traveling Passenger Agent, with headquarters at Dallas, Tex., vice Rush H. Barnes, resigned, to accept the position of General Agent of the Louisville, New Orleans & Texas Railway, with headquarters at Chicago.

Chicago & Eastern Illinois.—Charles Stone, Chief Clerk of the General Passenger Department of the Cincinnati, Hamilton & Dayton road, has been appointed Assistant General Passenger Agent of this road, with headquarters at Chicago.

William M. Corbett, Trainmaster of the Delaware division of the New York, Lake Erie & Western, has resigned to accept the position of Master of Transportation of this road, with headquarters at Danville, Ill.

Chicago, Rock Island & Pacific.—W. C. Page has been appointed Assistant Superintendent of the lines west of the Missouri River, with headquarters at Topeka, Kan.

Columbus Southern.—The stockholders elected the following directors last week: T. J. Pearce, T. E. Blanche,

S. A. Carter, of Columbus; Nelson Tift, of Albany; B. H. Hood, of Dawson; John Stevens, of Cusseta; J. W. English, W. B. Lowe and G. W. Parrott, of Atlanta. The directors elected the following officers: W. B. Lowe, of Atlanta, President; J. W. English, Atlanta, Vice-President; George Parrott, Atlanta, Secretary and Treasurer; Samuel F. Parrott, General Manager.

Cornwall & Lebanon.—J. D. Henderson has been appointed General Freight and Passenger Agent, with office at Lebanon, Pa.

Des Moines & Northwestern.—W. S. Jennings has been appointed General Passenger and Ticket Agent of this company, with office at Des Moines, Ia.

Elgin, Joliet & Eastern.—F. D. Reynolds has been elected Secretary and Treasurer, vice F. E. Worcester, with office in Chicago.

Ferney Mountain.—The officers of this Pennsylvania road are Daniel Shepp, of Tamaqua, President; M. M. MacMillan, of Mahanoy City, Vice-President and General Manager; John J. Hursh, of Tamaqua, Secretary, and William Boyer, Superintendent.

Grand Rapids & Indiana.—J. E. Parmelee has been appointed Assistant Roadmaster of the Northern division, vice F. S. Bowen, transferred. His headquarters will be at Petoskey, Mich.

Guatemala Central.—At the annual meeting of the stockholders of the company in San Francisco last week, the following Directors were elected: C. P. Huntington, Timothy Hopkins, S. F. Gage, F. S. Douty, C. E. Green, W. E. Brown, G. L. Lansing. The directors elected C. P. Huntington President; T. Hopkins, Vice-President; F. S. Douty, Treasurer, and G. L. Lansing, Secretary.

Houston, Central Arkansas & Northern.—Asa R. Bragg has been appointed Division Freight Agent of the road.

Hutchinson & Southern.—W. F. Hutchinson, of Hutchinson, Kan., has been elected Vice-President and Director.

O. P. Byers has been appointed Superintendent, with office at Hutchinson, Kan.

Kentucky Union.—J. M. Phillips has been appointed Superintendent of Transportation, with office at Clay City, Ky.

Lake Shore & Michigan Southern.—W. I. Fox, assistant superintendent of the Goshen and Michigan branch having been transferred to another position, the former office has been abolished, and the duties will hereafter devolve upon the Superintendent of the Michigan division.

Louisville, New Orleans & Texas.—Rush H. Barnes has been appointed General Agent of the passenger department of the road, with headquarters at 204 South Clark street, Chicago.

Minneapolis & St. Louis.—Charles M. Pratt has been appointed General Ticket and Passenger Agent. Mr. Pratt has been Acting General Ticket and Passenger Agent for some months.

Minneapolis St. Paul & Sault Ste. Marie.—Edward Williams has been appointed Superintendent of Motive Power vice T. H. Fraser, who has accepted a position with the Wells & French Car Co., Chicago.

Newark Bay.—The following are the names and places of residence of the directors of this company, referred to last week: Reon Barnes, Middletown, N. Y.; James F. Schaperkotter, Philadelphia; Frank R. Baldwin, Jersey City, N. J.; Frank W. Conrad, Perth Amboy, N. J.; Alfred H. Matthews, Orange, N. J.; Thomas W. Hulme, Mt. Holly, N. J.; and Sidney Ward, Brooklyn, N. Y. The officers are: Reon Barnes, President; J. F. Schaperkotter, Secretary, and Walter G. Berg, Chief Engineer.

New Brunswick Central.—At the annual meeting of this company held at Fredericton, N. B., last week, C. Ford Stevens, C. N. Skinner, M. P. Stephen Haas, Count de Bury, C. H. Lugin, F. E. Barker and J. P. Illesley were chosen directors.

Newport News & Mississippi Valley Co., Western Division.—Henry A. Hathaway has been appointed Southern Passenger Agent of this company, with headquarters at No. 311 Main street, Memphis, Tenn. E. L. Marmion having resigned as City Passenger Agent at Memphis, the position under that title has been abolished.

Norfolk & Western.—A. C. Hippey has been appointed Assistant General Manager, with office at Roanoke, Va.

Paris, Hearne, Brazos & Gulf.—H. K. Davis, J. M. Batley, L. Kaufman, H. B. Allen, L. W. Carr, A. W. Bridge, W. P. Ferguson, John W. Guenzel, all of Hearne, Tex., are the incorporators of this company.

Pennsylvania.—A. W. Moss, Passenger Train Master of the New York Division, has been appointed Superintendent of the Lewistown Division. E. T. Mander, Assistant Freight Train Master, succeeds him.

Pennsylvania Co.—F. P. Morris has been appointed Engineer of Maintenance of Way of the Toledo Division of the lines of the Pennsylvania Co.

Rome & Carthage.—At a meeting of the stockholders in Rome, N. Y., recently, the following Directors were elected: M. C. West, G. V. Selden, John R. Edwards, J. C. Smith, A. W. Orton, T. W. Singleton and O. E. Owens, Rome; M. P. Mason, Carthage; C. A. Chickering and A. L. Clark, Copenhagen; Chester Ray, Martinsburg; Peter Crofoot, Constableville, and H. G. Eulim, Turin. The officers chosen were: M. C. West, President; A. W. Orton, Treasurer, and John R. Edwards, Secretary.

Rutland.—The annual meeting of the stockholders of the company was held in Rutland, Vt., July 15, and resulted in the election of the following directors: Percival W. Clement, Gen. William Wells, George H. Ball, John W. Steward, Frederick Billings, James Roosevelt, Horace G. Young, Chester Griswold and David Wilcox.

San Antonio & Aransas Pass.—B. F. Yoakum, General Manager, and J. S. McNamara, both of San Antonio, Tex., have been appointed receivers of this road, and have given bonds in the sum of \$200,000.

Shenandoah Valley.—Walter MacDowell has been appointed Acting Auditor for the Receiver, to succeed T. H. Bransford, transferred to the Transportation Department. The office of the auditor will be at Roanoke, Va., as heretofore.

Shore Line (New Brunswick).—The following directors were elected at the recent annual meeting: Russell Sage, R. J. Cross, Giles E. Taintor, Sidney Shepherd,

H. M. Ruggles, New York; Frank Todd, St. Stephen, N. B.; H. H. McLean, St. John, N. B. R. J. Cross was elected President and H. H. McLean Vice-President and Managing Director.

Shuswap & Okanagan.—The annual meeting of this company was held at Victoria, B. C., last week. The following were elected directors: P. Larkin, M. Lumby, T. J. Jones, E. A. McQuade, Joseph Hunter, T. B. Hall and George Riley. The directors elected the following officers: Captain Larkin, President; M. Lumby, Vice-President; George Riley, Secretary and Treasurer.

South Atlantic & Ohio.—F. W. Huidekoper has been elected President, with office at No. 619 Fourteenth street N. W., Washington, D. C., vice Nathaniel Thayer. Geo. H. Graves has been appointed Superintendent, to succeed John Jenkins, assigned to other duties. His office will be at Bristol, Tenn.

Spokane Falls & Northern.—J. Hamill has been appointed Superintendent and O. D. Motz Purchasing Agent, both with offices at Spokane Falls, Wash.

Tecoma Belt Line.—I. W. Anderson, O. B. Hayden, Thomas Hosmer, Edmond Rice and others are the incorporators of this company.

Ultima Thule, Arkadelphia & Mississippi.—J. C. Weed has been appointed Superintendent, vice J. F. Miles, with offices at Arkadelphia, Ark.

Union Pacific.—The following changes have taken place: B. Campbell Assistant General Traffic Manager, with headquarters at Portland, Or.; J. G. Woodworth, General Freight Agent of the Pacific Division, at Portland, vice B. Campbell, promoted; F. S. Miller, Assistant General Freight Agent of the Pacific Division, with headquarters at Portland, Or., vice J. G. Woodworth, promoted.

RAILROAD CONSTRUCTION. Incorporations, Surveys, Etc.

Albany, Florida & Northern.—The Albany Investment & Construction Co. of Albany, Ga., has taken the entire contract for the completion of the road and its equipment. It is expected to be completed in October next. The subcontracts have been let for the first 35-mile section between Albany and Cordele, Ga., as noted last week under the heading Albany & Cordele. The survey is being made between these points at present, and will be continued toward Augusta. The company's charter provides for a road from Albany to the South Carolina state line at Augusta; from Albany to the Florida state line in the direction of Bainbridge, Ga., and from Albany to the Florida line in the direction of Quitman, Ga. The construction of the section of the northern division between Albany and Cordele will be medium work. There will be two bridges, 100 and 250 ft. long respectively. W. W. Campbell, of Americus, Ga., is Chief Engineer.

Astoria & South Coast.—It is stated that \$3,000,000 of the company's six per cent. bonds have been placed in England, the interest on the issue to be paid during construction. The company states that it will put 500 men on the construction work within a few weeks. Little work can be done during the winter, except on the 1,500 ft. tunnel. The sea side division from Astoria to Sea Side House, 18 miles, will soon be completed.

Autangville & Northern.—A charter will soon be applied for in Alabama for this road, referred to under New Roads, May 16. A survey is being made between Autangville and Booths Station, Ala., seven miles, by F. C. Faust, of Autangville, Chief Engineer.

Boston & Maine.—A survey is reported in progress for a projected line from East Wakefield, N. H., to the Maine Central at Cornish Station or at Hiram Bridge.

Calcasieu, Vernon & Shreveport.—The company has been organized by A. J. Perkins and others for the purpose of constructing a road to the Calcasieu River.

Canadian Pacific.—On the extension of the Glenboro branch in Manitoba, which is now in progress for about 35 miles, there will be built a bridge across the Souris River Valley about 3,000 ft. long, which will require about a million and a quarter feet of timber. The span across the river is 155 ft. long. The rest of the extension is easy prairie work.

The company is relaying its track between Winnipeg and Port Arthur, Ont., 431 miles, with 72-lb. rails.

Charleston, Cincinnati & Chicago.—McDonald, Shea & Co., Knoxville, Tenn., between Johnson City and Minneapolis, Va., 60 miles; W. Kenefick, Kansas City, Mo., Johnson City, Tenn., south 20 miles; P. P. Dickinson, 7 Nassau Street, New York City, Rutherfordton to Marion, N. C., 25 miles; Jones & Blanton, Knoxville, Tenn., Blacksburg to Newberry, S. C. The track laid since Jan. 1 aggregates 25 miles, on the various sections; this is from Johnson City, north 15 miles; Johnson City, south three miles, and between Rutherfordton, N. C., and Marion, N. C., seven miles. The line now under construction is from Johnson City north to coal fields at Minneapolis. This entire 90 miles has been graded except about 12 miles, and more track would have been laid but for want of ties. From Johnson City south to the state line between Tennessee and North Carolina, 23 miles, all is under construction, all of which must be finished and track laid by Aug. 20. From Rutherfordton to Marion, N. C., all the grading and bridging is completed on the 25 miles, ties are all ready, and the company is laying track as fast as possible. From Blacksburg to Newberry, S. C., a distance of 70 miles, the contract has been let and about 1,000 men are at work; about 10 miles is at present graded, and all is to be finished in 12 months. For the balance of the line to the Ohio River all the locations have been made and the company expects to let more work in a month or two.

Charleston, Kentucky & Western.—The sum of \$25,000 has been subscribed to make a survey for this road from Mt. Sterling, Ky., to Newport, via Sharpsburg, Carlisle and Falmouth, a distance of 92 miles. J. S. Spaulding is General Superintendent.

Charleston & Sea Island.—This company will apply at the next session of the South Carolina Legislature for a charter to build a road from near Charleston through portions of Charleston and Berkeley Counties towards the coast.

Chicago, Rock Island & Pacific.—J. A. Ware & Son, of St. Louis; McCormick Bros., and W. F. Callahan have been awarded the contracts for grading on the new line from South Omaha to Lincoln, Neb., a distance of about 54 miles. Smith, Gillett & Co. have the contract for the bridging and J. J. Fox for the masonry work. The surveys have been completed and grading has been

started. The work is heavy, but it is all earth excavation. The maximum grade is one per cent., and the maximum curves three degrees, compensated.

Colorado Midland.—The contract for the Busk tunnel and connecting railroad has not yet been closed, but will be shortly. The connecting railroad leaves the Colorado Midland a short distance east of Busk station and joins the main track again at Ivanhoe station. The tunnel line was located in November of last year. Its total length is 3.25 miles. The total length of the tunnel is 9,350 ft. The company expects to finish the work about April 1, 1892. The total length of the present line is 10.18 miles. The highest point on the grade of the present line is 11,528.30 ft. above sea level. The highest point on the new line 10,947.70 ft. The new line saves 6.23 miles of distance, 500.6 ft. of elevation and 1,958 degrees of curvature. The tunnel is through the Continental divide of the Rocky Mountains. The elevation of the crest of the mountain over the tunnel is about 12,000 ft. The elevation of the grade of the tunnel directly under the crest of the mountain is 10,872 ft. The cover is therefore 1,128 ft. deep.

Columbus, Lima & Milwaukee.—Construction work has been resumed on this road between Lima and Defiance, O., a distance of 43 miles. The company expects to have the line completed to Columbus, O., 80 miles from Lima, before January.

Craig Mineral.—Howard & Sears, of Eagle Rock, Va., have advertised for proposals for making and delivering 80,000 cross ties on the line of this road in Craig and Bouquet counties, in Virginia.

Denver & Rio Grande.—A standard gauge freight train was run July 10 over the line from Pueblo west to Salida, Col., 98 miles. This was the first standard gauge train to be operated over this section. The third track from Salida north to Leadville, 61 miles, has been finished, but standard gauge trains will not be put on this part of the line until the Tennessee Pass tunnel is finished, which will not be before Oct. 1.

Drummond County.—The grading is about completed for an extension of this line from Drummondville to St. Rosalie, Que., a distance of about 27 miles. Grading has been commenced, and is in progress under the direction of the company's officers, no contracts being awarded.

Evansville & Richmond.—A large force is laying track on the new line at Azalia, nine miles south of Columbus, Ind., to complete the line to a connection with the Cleveland, Cincinnati, Chicago & St. Louis at Westport, a distance of 17 miles, by Aug. 1.

Ferney Mountain.—This company has been incorporated in Pennsylvania to build a road from Ferney on the Philadelphia & Erie across the mountain to Waterville on the Fall Brook road, a distance of about 21 miles. The new line will shorten the distance between the Philadelphia & Erie and the Fall Brook roads about 25 miles. It is built principally to reach timber land, which is owned by the stockholders.

Grand Trunk.—The grading for the second track between Belleville and Shannonville, Ont., has been completed, and this section is ready for ballasting. The rock cutting at Milltown, Shannonville, Kingston Mills and Gananoque has been completed. Over 900 men are employed on the work, at an average of \$1.40 per day.

Great Northwest Central.—Freight and passenger trains will begin running in a few days on the first 50 miles of this road from Brandon, on the Canadian Pacific, through Rapid City, to Oak River, Man. The construction work on the second 50 miles northwest of Oak River is making rapid progress.

Great Western.—Notice is given that application will be made to the Dominion Parliament at its next session for an act to incorporate this company, with power to construct a road from Meadow Portage, Lake Manitoba, passing to the south of Duck Mountain to Saskatoon, in the district of Saskatchewan.

Gunpowder Valley.—John B. Brown, Secretary of this company, is prepared to receive proposals for the grading, masonry and tracklaying on this short Maryland road, near Baltimore. The office of the company is at No. 11 South Gay street.

Harrisburg Terminal.—Work on the road is being pushed rapidly. The dry weather of the past few weeks has been favorable for construction, as the water in the Susquehanna River is quite low, which has afforded opportunities for work on the river piers. Of the 24 piers, 11 are above water, and four are entirely finished and ready to receive the superstructure of the bridge. This is being manufactured by Cofrode & Saylor, of Philadelphia, and some of it is now about ready for shipment. Much of the masonry for the elevated road through the city of Harrisburg is completed, and Nolan Brothers, of Reading, who are the contractors, have a large force of men engaged on the work.

Harrisonburg & Western.—A company of this name has been organized at Harrisonburg, Va., to build a road from that point westerly through Rockingham County. J. P. Houck is president.

Jacksonville Southeastern Line.—E. M. Collins, of Edwardsville, Ill., who has the contract for the St. Louis extension of the Chicago, St. Louis & Peoria, will sublet the section from a point three miles south of Edwardsville to East St. Louis, a distance of 27 miles.

Kansas City, Fort Scott & Memphis.—It is stated that a final survey is being made for the extension between Minder and Carthage, Mo., about 26 miles. The line will probably pass through Alba, Galesburg and Georgia City. The contract for grading will soon be awarded.

Kansas City, Watkins & Gulf.—This road has been completed from Lake Charles, La., north toward Alexandria, for a distance of about 15 miles.

Lake Erie & Western.—It is stated that the road will build an extension from Minister to Piqua, O., a distance of 20 miles.

Lake Shore & Michigan Southern.—The surveys are progressing for the Toledo & Ohio Northern, the proposed line through the same territory between Toledo and Chicago as for the Toledo & Western is projected. The line has been definitely located from Fayette to Pioneer, O., a distance of about 12 miles, and grading will be commenced soon between these points. The grading will be completed this fall to Pioneer, but the track will probably not be laid until some local aid has been subscribed. From Pioneer westward the route has not definitely been determined. It may be via Fremont and Lima or through Angola and La Grange.

Lenoirs & Cincinnati.—This company has been incorporated in Tennessee for the purpose of constructing a road from Lenoir to a point near Harriman. A. P. Chamberlain, E. J. Sanford, R. N. Hood and others are interested.

Lexington & Eastern.—At an election held in Lexington, Ky., July 12, \$150,000 was voted by the city of Lexington and \$50,000 by the county of Fayette to the new road between Lexington and Richmond, Ky.

Los Angeles, Pasadena & Glendale.—The recent purchasers of this line, including R. C. Kerens, G. E. Leighton, G. W. Parker, of St. Louis, and T. B. Burnett, of Los Angeles, Cal., have incorporated the California Improvement Co. in Illinois, with a capital stock of \$1,500,000 to build and improve railroad properties. The company proposes to secure additional terminal facilities in Los Angeles, with the ultimate object in view of extending a line to the sea.

Louisville & Nashville.—The contract for the branch from Clarksville south to Dickson, Tenn., a distance of 32 miles, has been awarded to Munday, McTighe & Co., of Birmingham, Ala.

Louisville, Richmond & Dayton.—This is a projected road to extend from New Albany through the counties of Floyd, Clark, Jefferson, Ripley, Franklin and Union, to a point on the state line in Union County. Also from near the state line in Union County to Richmond. The length of the line will be 140 miles. The principal office is in Louisville, Ky. Of the capital stock, \$50,000 is reported subscribed. R. P. Rifenberck, of Cincinnati, is one of the projectors.

Macon & Dublin.—Myrick & Bowman are grading a five-mile section of this road at Macon, Ga. Forty miles of the road had been previously graded, and the remaining 13 miles to Dublin will soon be ready for the rails. Tracklaying will begin, it is stated, as soon as the rails, which have been ordered, arrive.

Manitoba & Southeastern.—The locating survey for this line has been made from Winnipeg southeast through South Ely in the direction of Lake of the Woods, for a distance of about 30 miles. Most of the right of way for this section has been secured. The company expects to begin grading very soon and to complete about 60 miles of the line during the present season. The entire distance between Winnipeg and the international boundary will be 110 miles. The maximum grade is 25 ft. per mile, and the maximum curves three degrees. The company has a land grant of 6,400 acres per mile. Alexander Logan is President and Alexander Stewart is Chief Engineer, both with offices in Winnipeg.

Mexican & Central American.—This company has been recently organized to take over the Mendez railroad concession from Vera Cruz to Alvarado, thence to Minatitlan and the Wilson concession from the Guatemala frontier to Tonala, connecting at the latter point with the Mexican Pacific. These roads when completed will give a standard gauge road from El Paso to the Guatemala frontier. Luis Mendez and W. T. Pritchard are the representatives in the City of Mexico.

Morristown & Cumberland Gap.—Rivenac & Thompson Bros., of Knoxville, have been awarded the sub contract for grading this road by Allison, Shafer & Co., and they have begun work near Morristown, Tenn.

Nashville, Chattanooga & St. Louis.—Bids will be received by Col. R. C. Morris, Chief Engineer, Nashville, Tenn., until July 25 for the grading, masonry, trestling, and tracklaying on the 25 miles of the Tennessee and Coosa extension from Littleton to a point near Guntersville, Ala., on the Tennessee River. Before this work is completed bids will probably also be asked for grading and tracklaying on a further extension from the Tennessee River to a point on the Huntsville branch in Madison County, Ala., a distance of 30 miles. A bridge will probably be built over the Tennessee River. The first 19 miles from Littleton are to be completed by Jan. 1, and the remaining sections to Guntersville by May 1, 1891. Hunter McDonald, of Huntsville, is engineer in charge of the extension. The surveyors on the Huntsville and Guntersville section have completed the line through Brownsboro, Rickett's Gap and Deposit to Wyeth City; and the engineers between Littleton and Guntersville have surveyed through Albertville from the former town.

New Roads.—Ogden, Utah, contractors (apparently Corey Bros.) are reported to have the contract for a new road from Baker City, Or., up the Sumpter Valley to coal mines. The contractors receive a \$60,000 subsidy voted by Baker City.

A survey is being made in the Sierra Madre Mountains above Pasadena, Cal., for a road to the summit of Wilson's peak. A company was recently formed by E. F. Spence, of Los Angeles. The line will be about 12 miles long, with a grade in no place steeper than 400 ft. to the mile. The estimated cost of the road is \$300,000. The height of the mountain is 5,920 ft., and at the summit it is proposed to lay out a summer resort.

New York, Susquehanna & Western.—Grading for the continuation of the double track from Hackensack to Paterson, N. J., has been completed, and the tracklaying will soon begin. It is expected that the work will be completed by Aug. 1.

Northern Pacific.—At present about 1,200 men and 400 teams are at work on the Tacoma, Olympia & Grays Harbor road. About 150 men are also at work on the Chehalis & Shoalwater bay road, but the force will be increased to 300 or 400 men in the course of a few days. The Grays Harbor line will probably be completed through to the harbor by Jan., 1891. The Chehalis & Shoalwater bay road may not be finished within a year from the present time. The line to Cooswa, also, may not be finished before February or March to that terminal point.

Omaha, Superior & Southwestern.—The survey has been completed from Superior to Hays City, Kan., a distance of 118 miles. The survey between Dodge City and Hays City, about 70 miles, has already been made, and it is stated that most of the right of way for this latter section has been secured.

Oregonian.—The commencement of construction work on the road in the vicinity of Portland, Or., has been delayed by various causes but a grading force under A. E. Monroe is now working six miles north of Silverton, near Butte Creek. A commencement has also been made at Silverton. As free right of way and station grounds are furnished the company, additional men will be put to work to push the line to completion. At the Portland end of the road much difficulty has been experienced in securing a good route from the plateau southeast of East Portland to the Southern Pacific line. Several routes have been surveyed, in some of which the

required one per cent. grade could be obtained, but only by many detours through valuable property. A suitable route has now been found which connects with the Southern Pacific. New rights of way must be secured and a permanent location made and then grading will begin.

Ottawa & Gatineau Valley.—Tracklaying will begin in a few days near Hull, Ont., opposite Ottawa on the section from that point north through Ironsides, and towards Chelsea, Que. The grading has been completed on about 20 miles of the line between these points. The connection with the tracks of the Canadian Pacific at Hull will soon be decided upon.

Paint Rock Coal & Iron.—This road was completed last week from Oneida, Tenn., to the company's mines, a distance of about 4½ miles. There is one tunnel on the line about 600 ft. long. W. C. Durand, of Chattanooga, had the contract.

Pajaro Valley.—Seven miles of this road has been completed, and the contractors, McMahon & Son, of San Francisco, expect to have the road finished in thirty days. This is a narrow gauge line, being built from Moss Landing, on the Pacific Ocean, to Watsonville, Cal., a distance of 14 miles. The principal traffic will be in transporting beets to the Spreckels sugar factory.

Paris, Hearne, Brazos & Gulf.—This company was incorporated in Texas last week with a capital stock of \$50,000, to build a road from Hearne south to Brenham, a distance of about 50 miles.

Paris, Marshall & Sabine Pass.—The Board of Trade of Marshall, Tex., is endeavoring to raise a subsidy of \$25,000 to extend this road from Marshall south to the Sabine River, a distance of about 25 miles. It is expected that the company will soon let the contract for this section.

Pecos Valley.—W. C. Bradbury & Co., of Denver, Col., have let subcontracts on this road from Pecos, Tex., north to A. L. Roy, H. M. Satterwhite, B. F. Shields, A. B. Mitchell, Witt Bros., H. P. Selden, and others. Fifteen miles of track has been laid and tracklaying is going on at the rate of one mile per day. The contractors began work June 20. One hundred miles of road is to be built and track laid by Nov. 1, 1890. Five hundred men and 350 teams are now on the work. There is some heavy work, but mostly scraper. The maximum grade is 1 per cent. and the maximum curves are 4 degrees.

Pennsylvania.—The work of elevating the tracks through Jersey City is progressing rapidly. The iron trestle is being put up at the rate of 200 ft. per day. Piles are being driven between docks D and E on the river front in connection with the erection of the new station.

Port Angeles Central.—This company organized recently at Port Angeles, Wash., proposes to build a road from Port Angeles to a point on the Columbia River or Puget Sound.

Providence, Ponnegansett & Springfield.—C. C. Martin, of Norwich, Conn., is said to have secured the contract for grading 21 miles of road from Hope, R. I., on the New York, Providence & Boston, to Danielsonville, Conn. It is proposed to continue the line to Springfield, Mass.

Rio Grande Western.—The Thistle extension has been referred to several times. The proposed line commences at Thistle on the main line of the road, and following the valleys of Thistle, San Pete and Servier, connects with the following towns: Thistle, Faubien, Mount Pleasant, Spring City, Ephraim, Manti, Salina, Richfield, Central, Elsinore, Joseph and Marysvale. The contracts are let for the first 32 miles of grading, and about 13 miles of this work is completed. The tracklaying will be commenced this week by the company's men. The bridges and buildings will also be built by the company and not under contract. H. T. Reynolds & Co., Thistle, Utah, have the contract for the first 32 miles of grading. The work on the rest of the line has not been let. No track has been laid excepting the rearrangement of the Thistle yard. The maximum grade is 1.5 per cent. for trains south and 1 per cent. for trains north. The maximum curve is 12 degrees. Old material from the main line will be used in the construction of this branch. The total length of the line from Thistle to Marysvale is 132 miles.

Rome & Carthage.—Some arrangement is expected to be soon made with one of the construction companies which are negotiating for the contract to build this road. It will be about 70 miles long from Rome north to Carthage, N. Y., on the Rome, Watertown & Ogdensburg.

Shuswap & Okanagan.—The contract for the construction of the entire line from Sicamous to Okanagan Lake, B. C., has been let to T. W. Patterson & Co., the work to be finished before 1891. The rails have been purchased and are now on the way from England.

South Bound.—Louis McLain, of Savannah, Ga., has been awarded the contract for the grading, trestling and tracklaying on the first section of this road from Savannah to the crossing of the Savannah River at the South Carolina state line, a distance of about 29 miles.

Southern Pacific.—Nearly six miles of grading has been done on the division from Merced north to Oakdale, Cal. The bridge across Bear Creek has been finished and tracklaying will commence at once. Turton & Knox, of Sacramento, the contractors, have about 400 white men employed.

Tacoma Belt.—Isaac W. Anderson, Edmund Rice and O. B. Hayden have filed articles of incorporation in Washington for this company. It is proposed to build a road from the Northern Pacific, near Meeker's Junction, southwesterly to Lake View and to the east end of American Lake, thence along the lake front to its western end and Steilacoom. From Steilacoom the line will follow along the shore of the narrows of Puget Sound to Point Delance and Commencement Bay to a point on the Washington Short Line near the Tacoma Smelting & Refining Co.'s works. Docks, wharves and warehouses will be built at different points.

Vanegas, Cedral & Rio Verde.—F. G. Bruno, of Cedral, Mex., has the contract for the grading for an extension from Cedral to Matehuala, about 21 miles. The tracklaying and bridge work will be done by the company. Three miles of the grading has been finished and about 450 men and 60 teams are at work. The surveys have been made for about five miles from Matehuala toward Tula and Rio Verde. The entire line between Vanegas and Rio Verde will be about 220 miles long, but little construction work is likely to be done beyond Matehuala this year. The work between Cedral and Matehuala is light, with maximum grades of 1½ per cent.

Western Counties.—The grading on the extension from Annapolis to Digby, N. S., a distance of about 20 miles, has been finished, with the exception of two cuts, one of rock and one of earth. Tracklaying is in progress. About 400 men are working on the line. There are a large number of bridges and trestles on the extension, the most important being over the Moose River, 1,300 ft. long, with a 60-ft. draw and seven piers of concrete; and over the Bear and Little Joggins rivers, each 1,300 ft. long, with draws of 80 ft. All the bridges on the line are of wood or concrete piers except that at Allen River where it was necessary to drive piles to a depth of 75 ft. This bridge is 790 ft. long. The bridge over the Moose River will probably be completed by July 20. The bridging and trestling aggregates over 8,000 ft. of timber. The contractors have used 200,000 ft. of piling and 2,100,000 ft. of Southern pitch pine.

GENERAL RAILROAD NEWS.

Alabama Midland.—The stockholders of the Alabama Terminal & Improvement Co. met at Troy July 9 and confirmed the sale of the Alabama Midland to the Plant Investment Co., which buys a majority of the common and preferred stock of the company. The road will be operated in connection with the Savannah, Florida & Western, with which it connects at Bainbridge, Ga.

Austin & Northwestern.—The company has sold the road from Austin to Burnet, Tex., 60 miles distant, with all the franchises, to C. W. Holloway and others in Texas. The amount paid and terms agreed upon have not been made public. The road will be changed to standard gauge immediately, the roadbed having been already prepared, and it will be extended at once to the iron region of Llano.

Missouri Pacific.—At a special meeting of the stockholders, held in St. Louis, July 15, the capital stock of the company was increased in the sum of \$10,000,000, and the bonded indebtedness of the company will be increased in a like amount. The \$10,000,000 bonds are collateral mortgage bonds, to be secured by a deposit of first mortgage bonds of auxiliary companies, for which the increased capitalization is made in order to wipe out old construction and equipment indebtedness. Seven million dollars of the bonds and \$700,000 of the new stock will be offered at \$950 for each \$1,000 bond and one share of stock.

New York Central & Hudson River.—The work of depressing the grade of the Harlem Division between 138th street and Bedford Park, New York City, and the construction of two additional main tracks between 138th street and Woodlawn, has now been so far completed that the four tracks are in use for the whole distance except for half a mile at Fordham, where the depression of the grade and the construction of an overhead bridge has been delayed for the completion of a sewer which is necessary for the drainage of the roadbed and by other reasons. All of the tracks are now ballasted with stone as far as completed on the new grade, except for about one mile between Williamsbridge and Woodlawn, which is ballasted with gravel. All of the streets crossing the depressed portion of the line are carried on overhead bridges and a number of these bridges are completed; but the new station buildings at Melrose, Morrisania, Central Morrisania, Tremont and Fordham, which are to be built on or near these bridges, have not yet been begun. The system of automatic pneumatic block signals being put in by the Union Switch & Signal Co., for use on this rebuilt line, is in course of construction but not yet ready for use.

North Topeka, Rossville & Silver Lake.—This road was sold at Topeka, Kan., recently, by order of the United States Circuit Court to satisfy the claims of the bondholders. It was bought by A. B. Pomeroy, Robert Giles and A. C. Merritt, the price paid being \$4,975. The road is about seven miles long from Gordon street, North Topeka, to Silver Lake. It was built about two years ago. The purchasers are the projectors of the new Topeka, Westmoreland & Marysville road, and it is proposed to make the road a part of the new line.

Oregon & Transcontinental.—The company gives notice to its stockholders that arrangements have been completed for its reorganization. The North American Co., a New Jersey corporation, has agreed to purchase all of the assets of the Oregon & Transcontinental and to issue its stock share for share for that of the other company. Beginning July 14, the Farmers' Loan & Trust Co., of New York, will receive, subject to the contract referred to, deposits of Oregon & Transcontinental stock, for which it will issue its negotiable certificates. As soon as 250,000 shares of the stock have been deposited, the trust company will issue the stock of the North American Co. in exchange for its certificates.

Philadelphia, Newtown & New York.—A special meeting of the stockholders of the company was held in Norristown, Pa., last week for the purpose of voting on an increase in the capital stock of the company from \$1,200,000 to \$2,000,000. Considerably over two-thirds of the shares were voted in favor of the increase. The additional capital thus obtained is to be devoted to making a connection with the Philadelphia & Reading New York line, that trains may be run into the Ninth and Green streets station, Philadelphia.

TRAFFIC.

Chicago Traffic Matters.

CHICAGO, July 16, 1890.

The work of checking up the advanced west-bound freight rates has been completed and the new rates will be made effective August 1st. A joint conference of the lines in the Western and Trans-Missouri Freight Associations resulted in the advance of the through rates beyond the Missouri River corresponding to the advance east of the river. At an informal conference of Managers of the Southwestern lines held last week it was considered advisable to have a meeting of the lines and endeavor to secure an advance in the east-bound live-stock and other rates from Kansas City and river points to Chicago. This meeting was begun on Tuesday and continued through to-day, but has adjourned until tomorrow without result.

The action of the Chicago, Milwaukee & St. Paul in reducing the soft coal rates 25 cents per ton from Milwaukee to Sioux City and other points has been met by the Chicago & Northwestern from Springfield Valley, Ill., and other points are likely to be affected. It is not improbable that the St. Paul will make a further reduction, but as yet no notice of such intention has been given.

The Western Passenger Association has authorized a

rate of one first-class fare for the round trip from association points to the eastern gateways for the G. A. R. encampment at Boston, Aug. 10-16. The eastern lines will make a rate of one lowest first-class fare for the round trip, which is \$19 from Chicago and \$22.50 from St. Louis. It is reported that some of the roads have already cut the \$19 rate.

Shippers are "kicking" about the adoption of the new form of bill-of-lading, claiming that they are put to great expense and trouble to procure new blanks to take the place of the old form, a large supply of which they have on hand.

The evils attending the issuing of round trip excursion tickets have been again manifest the past week; the scalpers having done a rushing business in return portions of Milwaukee and St. Paul tickets, east and south-west from Chicago.

A dispatch from St. Louis says all the lines are making a \$10 round trip rate to Kansas City, St. Joseph, Atchison and Leavenworth from that point.

The Central Traffic Association has made a reduction on live hogs, provisions, lard, pork, grease and tallow from 25 cents to 23 cents, and on bulk meats from 30 to 28 cents, Chicago to New York, with corresponding decreases to intermediate points. The reduction goes into effect July 21.

The hearing in the injunction suit of the Wabash against the Chicago & Western Indiana was heard before Judge Tuley last week. The Wabash claims the right under its lease to use all the lines of the Western Indiana, while the latter claims that the agreement covers only the line from Auburn Junction to Chicago. The real point at issue, as stated in my despatch of June 4, is whether the Wabash shall be allowed to carry out its contract with the Canadian Pacific and let the trains of that line into the Polk street depot (one-fifth interest in which is owned by the Chicago & Grand Trunk) over tracks leased from the Western Indiana. The Western Indiana claims that the Wabash intends assigning its rights to the track in question to the Canadian Pacific, but this the Wabash denies in court. To-day Judge Tuley decided in favor of the Wabash, making perpetual the injunction secured by it some time since restraining the Western Indiana from interfering with the use by the Wabash of the common tracks from Hammond, Ind., to Polk street. He also dismissed the cross bill of the Western Indiana, which was brought to restrain the Wabash from entering into any agreement with the Canadian Pacific for the use of the Western Indiana tracks. The Western Indiana took an appeal.

Traffic Notes.

The lake rate on corn from Chicago to Buffalo fell last week from 3 to 2 cents per bushel.

The Missouri Railroad Commissioners have decided, on the complaint of G. S. Hoss, that the Kansas City, Fort Scott & Memphis road is guilty of violating section 2,633 of the laws of Missouri in charging complainant \$2 per carload more for the transportation of coal from Carbon Centre, Mo., to Kansas City than it charges other parties for the same service. Complainant says that this \$2 is a recent arbitrary addition to the regular rate of 70 cents per ton, but the published account gives no intimation of the basis or pretext on which this charge is made. The commissioners also fine the railroad company \$1,000 under section 2,645 of the law for not filing with the board its tariff showing this change in the rate. The shipments in question were carried through Kansas and are therefore claimed by the road to be interstate traffic and not within the jurisdiction of the Missouri commissioners. It is also claimed that the commissioners have no authority to assess fines.

Switching Charges in Iowa.

The Iowa Board of Railroad Commissioners has made the following order regarding rates for switching in that state:

The rates established by this board to govern switching charges at stations in Iowa, on cars transferred from one line of railway to another, will be as follows: For any distance not exceeding one mile, \$1 per car; for any distance of one mile and not more than two miles, \$1.50; for any distance in excess of two miles and not more than three miles, \$2; for any distance in excess of three miles and not exceeding four miles, \$2.50.

It is thought that the roads will refuse to adopt the new switching tariff for the same reason that they are contesting the right of the Iowa Commission to fix joint rates over different lines. The fact that Commissioner Dey dissents from the ruling of his colleagues encourages the railroads in their fight against the new order.

Kansas Grain Rates.

The Kansas Railroad Commissioners have denied the application of the Farmers' Alliance for a reduction of the local grain rate in Kansas to Missouri River points, on the ground that a reduction would do the petitioners no good. At the close of the decision the Board expresses the intention of ordering a revision and reduction of the rates upon the local distance tariff.

East-bound Shipments.

The shipments of east-bound freight from Chicago by all the lines for the week ending Saturday, July 12, amounted to 60,484 tons, against 25,513 tons during the preceding week, an increase of 31,971 tons, and against 43,764 tons during the corresponding week of 1889, an increase of 16,720 tons. The proportions carried by each road were:

	W'k to July 12.		W'k to July 5.	
	Tons.	P. c.	Tons.	P. c.
Michigan Central.....	7,989	13.2	4,141	13.2
Wabash.....	4,299	7.1	2,099	7.1
Lake Shore & Michigan South.	9,200	15.2	4,751	15.2
Pitts., Ft. Wayne & Chicago...	8,162	13.5	3,152	13.5
Chicago, St. Louis & Pitts....	6,333	10.5	4,172	10.6
Baltimore & Ohio.....	4,091	6.7	1,478	6.7
Chicago & Grand Trunk.....	7,900	13.1	3,299	13.1
New York, Chic. & St. Louis...	5,028	8.3	1,959	8.3
Chicago & Atlantic.....	7,422	12.3	3,462	12.3
Total.....	60,484	100.0	28,513	100.0

Of the above shipments 1,412 tons were flour, 18,677 tons grain, 1,526 tons millstuffs, 7,455 tons cured meats, 3,189 tons lard, 11,191 tons dressed beef, 2,805 tons butter, 1,930 tons hides, 1,357 tons wool and 8,052 tons lumber. The three Vanderbilt lines carried 36.7 per cent., of all the business, or 1 per cent. less than during the preceding week, while the two Pennsylvania lines carried 24.1 per cent.